NORTH IDAHO

1974

PLAN OF OPERATIONS

FOR A

COOPERATIVE DOUGLAS-FIR TUSSOCK MOTH

CONTROL PROJECT

State of Idaho
Department of Public Lands
(208) 667-7989 (Forest Insect Unit)

U. S. Forest Service
Northern Region

Forest Industry
North Idaho

Bureau of Indian Affairs
Coeur d'Alene Tribe

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I. INTRODUCTION

Previous History

Outbreaks of the Douglas-fir tussock moth, Orgyia pseudotsugata McD., have occurred in northern Idaho on a cyclic basis. History of these outbreaks has been reviewed by Tunnock (1973).

Indications that the current outbreak was building up were discovered in Coeur d'Alene, Idaho, during 1971 when several ornamental firs were defoliated (Tunnock and Honing, 1971) and in 1972 when egg masses were found within a 100-acre logging unit near Charles Butte, St. Joe National Forest, Idaho (Tunnock, 1972). A February, 1973, egg mass survey conducted in areas of previous outbreaks substantiated the buildup and predicted a minimum of 50,000 acres of visible defoliation (Livingston and Tunnock, 1973). Aerial surveys completed during the summer of 1973 showed nearly 110,000 acres with varying degrees of visible defoliation (Tunnock, et al., 1973; USDA Environmental Statement, 1974).

To predict what this outbreak would do in 1974, a broad-scale egg mass survey was conducted during October and November, 1973. The survey was a cooperative effort of a special task force established by the Northern Rockies Pest Action Council. Participants included the State of Idaho Department of Public Lands; U. S. Forest Service, Region 1; Potlatch Forests, Inc.; Bureau of Indian Affairs; Corps of Engineers; and University of Idaho.

The Existing Problem

The 1973 cooperative egg mass survey established that 103,878 acres of forests in North Idaho have overwintering tussock moth populations capable of causing damage in 1974. Of these, a critical 57,608 acres will be sprayed with DDT. The remainder has been set aside for testing of microbial agents (Dewey, 1974). An additional 153,556 acres are also infested but apparently at lower population levels (Table 1) (Tunnock and Livingston, 1974; Tunnock, et al., 1974).

See Page 2 for Table 1.

Table 1
Acres of possible activity, proposed treatment, and treatment option in northern Idaho during 1974

Unit	Some activity	Proposed treatment area	Treatment option
Coeur d'Alene			
State and private		998	4,096
Forest Service		17,869	24,678
Subtotal	55,081	18,867	28,774
St. Joe			
Coeur d'Alene IR		988	3,512
State and private		30,268	80,317
Forest Service		14,847	13,670
Subtotal	234,549	46,103	97,499
Clearwater			
State and private		2,686	861
Forest Service		1,747	547
Subtotal	81,552	4,433	1,408
Craigmont			
State and private		4,762	7,162
Forest Service		0	0
Subtotal	21,338	4,762	7,162
Nezperce			
State and private		1,312	1,045
Forest Service		28,401	17,668
Subtotal	112,301	29,713	18,713
North Idaho Total	504,821	103,878	153,556

The North Idaho outbreak is in the early stages of the pest's damage cycle. The infestation is still extremely spotty and scattered. Between the NezPerce Unit and the Coeur d'Alene Unit the infested areas are in different stages of pest development. March, 1974, virus incidence in overwintering egg masses ranges from 1-5 per cent except for one egg mass collected on the NezPerce Unit. Damage estimates for 1973 indicate that 10.3 million board feet of timber has been killed and unacceptable growth loss has been caused.

1974 projected impacts are: 85.4 million board feet of timber will be killed, 12.6 million board feet of growth loss will be caused and a net loss of 3.109 million dollars will result should the pest complete its feeding in 1974 (USDA Environmental Statement, 1974). Damage is expected to continue through 1975 and may also occur in 1976 and beyond.

Mixed ownership is a problem in the outbreak area. Over 442 private forest owners, several forest industry ownerships, state and municipal forests, Coeur d'Alene and NezPerce Reservation Lands, USDI-Bureau of Land Management and Watersheds affecting Corps of Army Engineers, Dworshak Reservoir are involved.

Of the 103,878 acres that meet the spray criteria 46,270 acres of National Forest lands in the Coeur d'Alene and NezPerce Units will be used for testing in 1974 of two microbial agents: the polyhedrosis virus and Bacillus thuringiensis. Thus a net of 57,608 acres are currently planned for spraying with DDT. The proposed treatment area may be increased through addition of portions of the 153,556 acres of treatment option area which are currently being re-evaluated.

Description of Life Cycle

The Douglas-fir tussock moth, Orgyia pseudotsugata McD., is a native pest of North America (Franclemont and Ferguson, 1974). History of the outbreaks have been reviewed by Tunnock (1973). After overwintering in the egg stage, the larvae hatch in late May or early June. Hatch coincides with bud opening of the preferred host species. The small hairy larvae, about 1/8 inch long, start feeding on the host's new needles, normally true firs Abies ssp and Douglas-fir, Pseudotsuga menziesii var. glauca (Beissner) Franco.

Damage is first apparent on the new foliage, causing it to shrivel and turn brown. By mid-July, larger larvae feed on both new and old foliage. They first strip the outermost top branches of the trees and then feed into the inner and lower crown (Mason and Baxter, 1970; Wickman, et al., 1971). Some trees are top killed. Others are completely defoliated and may be killed in one season. Trees weakened by defoliation suffer growth loss and some are subsequently attacked by bark beetles (Wickman, 1963). Other physiological stresses brought about by severe defoliation undoubtedly contribute to mortality causes also.

The mature larvae pupate in late July or August. The adult moths emerge from the cocoons in 10 to 18 days. The flightless female attracts a flying male, mates and lays her eggs on the pupal case. The adults then die. The egg mass remains dormant until the following spring.

The tussock moth has natural controls, parasites and predators, as well as a disease organism, the polyhedrosis virus. The virus is usually the cause for reducing the Douglas-fir tussock moth to endemic population levels. However, it typically does not affect the outbreak population until late in the season after feeding by the larvae as been completed. Termination of tussock moth outbreaks by natural forces is variable and may occur in one to ten years (USDA Environmental Statement, 1974). One study of 33 recorded outbreaks since 1928 in the northwest found that twenty-one per cent collapsed after four or more years of pest damage (Parsons, 1973).

Objectives of the 1974 Control Project

The primary objective of the control project is to prevent pest caused mortality and damage to trees on State, Private and National Forest lands. As stated in the Cooperative Environmental Statement, the acreage and volume of forest crops damaged by pest activity in 1974 would result in a local

basic economy net loss of 3.109 million dollars. Forest crop damage would result in a direct impact to lumbering and 442 private woodland owners. The Coeur d'Alene Indian Tribe would also be financially injured by accelerated pest losses of forest crops.

Ancillary benefits would be gained through suppression of the pest by maintenance of Watershed, equilibrium of wildlife populations and esthetic values. Some increases in wildfire hazards would be prevented.

II. CONTROL STRATEGY

Control Criteria

Areas where control of the tussock moth is deemed necessary to avoid unacceptable defoliation or tree mortality will be delineated by use of the evaluation key[1/] (Appendix No. 1). Fall egg mass surveys showed a total of 141,613 acres with populations meeting control criteria based on old to new mass ratios and egg mass density (Tunnock and Livingston, 1974). The incidence of naturally occurring virus in the population and egg viability has been used as indicated in the key to further adjust areas needing treatment to 103,878 acres (Tunnock, et al., 1974).

Further adjustments to treatment areas will be through the designation of sensitive areas where DDT will not be applied. Spray applicators will shut off the spray within 200 feet or one swath width of pastures, crop lands and dairy farms. Important fisheries will be designated through consultation with the Idaho Department of Fish and Game.

Sensitive farming areas will be designated by the State of Idaho, Department of Public Lands in consultation with the landowners. Managers of apiaries will be notified so that hives can be moved or avoided. The watershed for the City of Troy will be treated according to the desires of the city council. Several biological test areas exist within the present boundaries of the proposed treatment area. The University of Idaho, College of Forestry, has indicated that the Hatter Creek deer enclosure should be treated if it meets the control criteria. No DDT will be applied closer than one mile to areas designated for testing the polyhedrosis virus and Bacillus thuringiensis (Dewey, 1974), and to larch casebearer parasites release sites where protection is deemed necessary through consultation with the agency making the release. These areas will not be treated as long as the action is in accordance with the desires of the owner of the land in question. Of the two casebearer parasites involved, Agathis will be further protected by being in the pupal stage during the spray application. However, Chrysocaris adults, which emerge in early June (R. Ryan, personal communication), will be subject to the spray if they range beyond the protection zone.

1/Key developed by the working group of the Interagency Douglas-fir Tussock Moth Steering Committee

Host type information, consideration of the desires of the individual landowners or managers and the judgement of the entomologist in charge will also be used in plotting the final treatment boundary. The minimum size forest area that will be considered for treatment is 10 acres.

There are nearly 154,000 acres in Northern Idaho that currently are designated as needing further evaluation before a control decision can be made. These evaluations will be conducted as access becomes available. Five trees will be felled at each designated plot site. Four branches cut from each of the top, middle and bottom crown levels will be measured (length and width of foliar area) and observed for presence of egg masses. The information will be recorded and the number of larvae per thousand square inches of foliar area will be calculated. Those areas that meet the spray criteria will be added to the project. Also, aerial surveillance will be maintained soon after egg hatch to detect new infestation centers that may appear outside of the present areas recommended for control. Any new infestation (Appendix No. 2) established by the Idaho Board of Land Commissioners will not be treated.

Active Ingredient and Application Rate

Application of the insecticide DDT (Dichloro-diphenyl-trichloroethane) will be at the rate of one gallon of finished spray per acre. Each gallon of spray will contain 3/4 pound of DDT dissolved in .94 quart of auxiliary hydrocarbon solvent with sufficient fuel oil to make one gallon of solution at 60° Fahrenheit. Droplet size will be not less than 150 microns or larger than 250 microns, mass median diameter. The spray system will be of conventional type. Proper calibration will be verified by the U. S. Forest Service, Region 1 air contracting officer and reported in writing to the project leader before the aircraft can be used on the spray project.

The technical grade DDT will be purchased under a U. S. Forest Service joint Region 1, Region 4, Region 6 contract (Appendix No. 3). The technical material will be shipped to a contract formulator who will dissolve it with the proper hydrocarbon solvents to make the 3/4 pound per gallon formulation. The resultant material will be shipped by truck to a centralized location where it will be stored ready for distribution to the heliports. The contract for formulation of the spray will be handled by the State of Idaho (Appendix No. 4).

Method of Application

Helicopters will be used to apply the insecticide (U. S. Forest Service, Appendix No. 5). Air speed will range from 40 to 90 miles per hour depending upon size of aircraft. Small helicopters operating at slow speeds will be used near sensitive areas. Swath width will be a minimum of 100 feet; height above the forest canopy will range from 40 to 60 feet to assure minimal drift. Application will be made in early morning hours when air conditions are most favorable; i.e., when winds are less than 6 mph and the temperature is 70° F. or less. Also, spraying will not be done during rain, with threat of immediate rain, while the foliage is wet from precipitation, or if the spray will not settle into the trees.

Each spray pilot will be provided with photographic or topographic maps of the spray blocks. Each day after spraying has been completed, the pilots will be briefed and make orientation flights as necessary to familiarize themselves with areas to be sprayed the next day.

It is estimated that due to difference in elevation and aspect, development of the tussock moth will vary 7 to 15 days. Due to these differences the control areas will be divided into spray blocks of corresponding elevation and aspect which will be released for treatment when egg hatch is general in that particular block. Spraying will be completed in the interval of not less than 7 and not more than 15 spray days (Appendix No. 5).

One observation helicopter will be assigned to a maximum of two spray helicopters and will be used to monitor spray coverage and for general observation needs. In addition a small fixed wing will be kept available at or near the project headquarters for use as needed.

Maps and Photos

A sufficient supply of USGS topographic maps, scale 1:62,500, will be procured for field and general use. Also, high altitutde photography, scale 1:31,680, with spray blocks marked on them will be given to the pilots to assist them in the application. Two-inch-to-the-mile maps will be used for recording progress on all phases of the project. Smaller scale maps will be used in the Information and Education Program and to delineate sample areas for population development monitoring.

Heliport Selection

The number and size of heliports needed will depend on the size of aircraft used. Final selection of sites will take place after awarding of the contract for the aircraft.

The heliport sites will be selected to minimize the flying time required between the heliport and treatment areas. Alternate sites will be located so that as the need arises, operations can move from one area to another in order to maintain short turn-around times. Other specifications include the following:

1. Sites will have access for the trucks hauling the insecticide.

2. Sites will be of adequate size to facilitate safe maneuvering and parking of two spray helicopters working on a simultaneous basis.

Sites selected as heliports will be subject to approval by the Air Operations Chief and a representative of the aircraft contracting firm. All government and state agencies having jurisdiction within the area will be contacted for information on the presence and location of existing heliports. These will be utilized where possible. New sites will be developed as needed.

Storage and Loading Equipment

The spray, in final form, will be delivered to and stored at a central location in facilities provided by the formulation contractor. A minimum of 25,000 gallons will be on hand ready for use approximately five days prior to the first day of application with the remainder to be delivered within five days after the start of application. The formulation contractor will also provide adequate facilities and personnel for loading and measuring of the insecticide into transportation facilities furnished by the aerial spray contractor. Measuring may be accomplished by an accurate metering system, loading of calibrated tank trucks, or some other system which will provide accurate measurement of the amount of insecticide delivered (Spray Formulation Contract, Appendix No. 4).

The aerial spray contractor will provide equipment and personnel for transport of the insecticide from the storage site to heliports and for loading it into the aircraft. Adequate insecticide to complete one day's work will be on hand at each heliport at the beginning of each working day.

The heliport manager will be responsible for recording the amount of insecticide applied by each helicopter during the day. This will be recorded on the Daily Record of Helicopter Operation form (Appendix No. 6). This information will be used to help verify spray application rates. The Assistant Air Operations Chief will keep a spray block summary sheet (Appendix No. 7) to verify completion of important steps of the operation in each spray block.

When treatment of a spray block has been completed, the Assistant Project Director will fill out the Spray Block Certification form (Appendix No. 8) to notify the contractor whether the work is acceptable or not.

Meteorological Monitoring

The Meteorology Chief will provide meteorological information and daily weather forecasts to the project leader no later than 5:00 p.m. of the day before spray operations are to take place. If conditions change between the afternoon forecast and early morning spray operations, he will immediately notify the Air Operations Chief so that work plans can be modified as needed. In addition, weather checkers stationed in the spray blocks will measure wind and temperature beginning one half hour before spray time and at 15 minute intervals throughout the remainder of the spray day. This and other information as listed on the Data Sheet (Appendix No. 9) will be recorded daily. When wind or temperature exceed allowable limits for spray (6 mph and 70° F) the weather checker will immediately notify the Meteorology Chief who will then notify the Air Operations Chief of the need to stop spraying in that block.

Quality Control

To assure quality control there will be adequate communication facilities available to all phases of the operation. Radios will be provided to heliport manager, weather checks, observational aircraft, and aerial observers. In addition, a telephone operator will be on 24-hour duty at base headquarters.

Quality control will also be effected through implementation of the following:

1. The dosage/gallon will be verified before any spray will be applied.
2. The amount of insecticide used will be metered at the bulk storage facility and at the heliports. This information will be compared with the acres covered for a check on application rate.
3. Samples of the spray mix will be taken each day and stored for testing if further verification of concentration is necessary.
4. Weather will be monitored to assure proper spray conditions.
5. Small aircraft will be used around sensitive areas.
6. Observation aircraft will be used to assist the spray aircraft in maintaining accurate spray coverage. The observer will also watch for leaking or plugged nozzles and will time the duration of spraying for each helicopter load. This and other general information will be recorded on the Aerial Observation Report (Appendix No. 10).
7. Spray deposit cards will also be used to verify proper coverage. A minimum of two card lines of 20 cards each will be placed in the spray blocks before spraying. The cards will be numbered with a three-number system; i.e., 1-2-14. The first number (1 in the example) will be the spray block number, the second (2 in the example) will be the spray line number, and the third (14 in the example) is the card number. Care must be taken to locate them in openings with a diameter at least equal to the heighth of surrounding trees. The cards will be placed either the night or morning before spray and picked up the afternoon of the day spraying takes place. Pertinent information will be recorded by the spray deposit field crew member on the Spray Distribution Record (Appendix No. 11). Then the cards and form will be delivered to the field laboratory for analysis of the spray deposit. The results of this analysis will be recorded on the same form and summarized for each plot on the Spray Block Deposit Sheet (Appendix No. 12).
8. Progress maps will be up-dated, and a Progress Report (Appendix No. 13) will be filled out daily.
9. Spray pilots will be briefed daily and orientation flights will be made as necessary for familiarization with the next day's spray area.

Communication

Because of the widespread nature of this project, communications are of vital importance for efficiency of operation and safety of the participants. Communications will be needed between project headquarters, helispots, spray aircraft, observation aircraft, meteorologist, weather checkers, entomologist, spray deposit crews, and development checker crews.

The observation aircraft will be the central relay point between the spray aircraft and the Air Operations Chief and unit headquarters. The Air Operations Chief will receive and coordinate all information pertinent to continuation of the spray operation.

The Communications Chief will develop and conduct training sessions for standard and emergency communications.

Ground to Ground -

State radio ground net will be utilized for communications between the Entomology Chief, Meteorology Chief, and their respective field crews.

U. S. Forest Service gound net will be used for communications between Air Operations Chief, Entomology Chief, Meteorology Chief, Helispot Managers and the Unit Headquarters. Telephones will be installed and used as needed.

Ground to Air -

U. S. Forest Service net will be used for communications between the Air Operations Chief and the observation aircraft.

Air to Air -

The observation aircraft and the spray aircraft will be required to have Air net FAA radios for use of 122.9 and other aircraft channels.

Spray helicopters shall have installed as a minimum one 90 channel VHF communications transceiver and will communicate with the observation aircraft on VHF. Frequency assignment will be made during the pre-spray briefing.

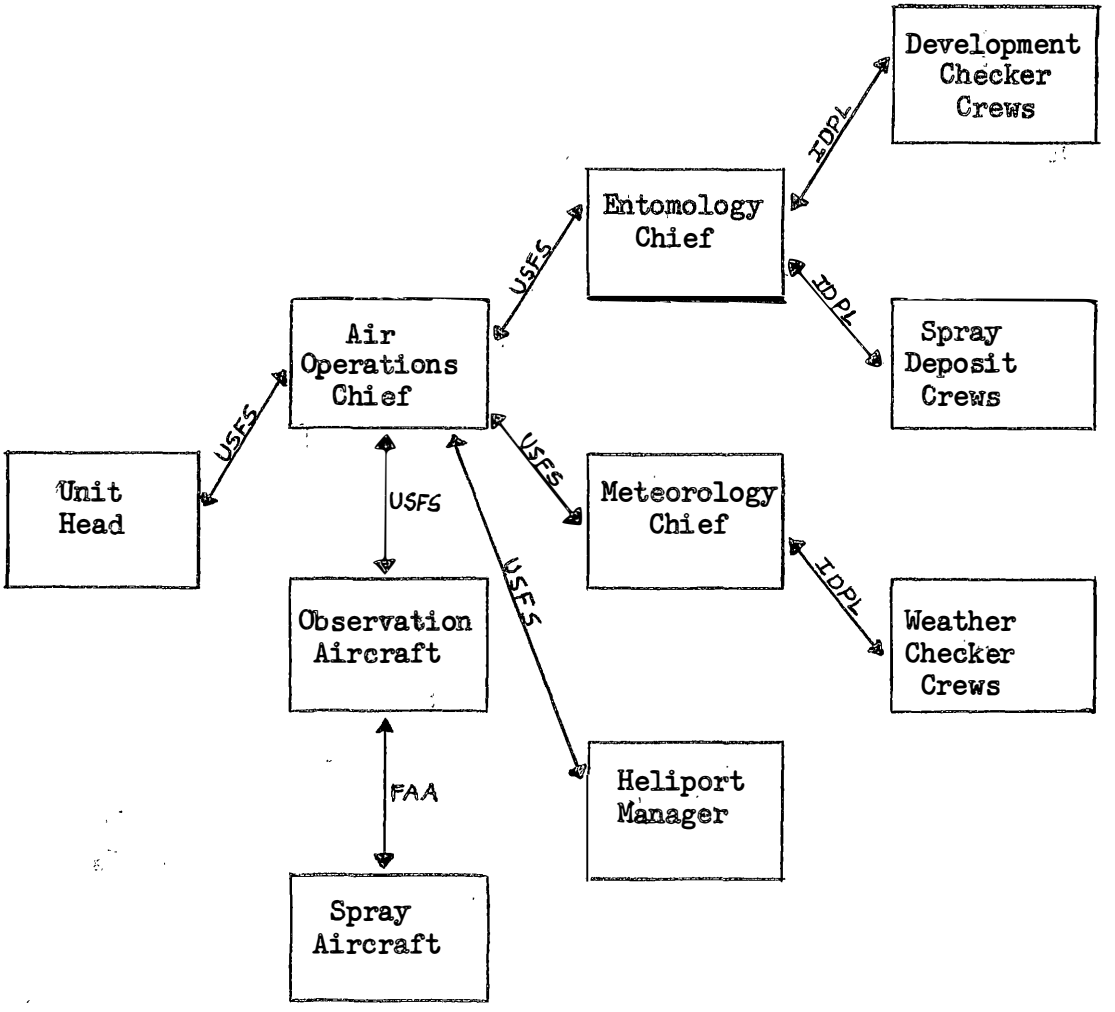
Observation helicopters shall have as a minimum one 90 channel VHF Com Transceiver and will communicate with the spray helicopters on VHF. They will have facilities for installation of a Forest Net radio for communications between the observation aircraft and the Air Operations Chief.

The communications intertie is as follows:

See Page 10 for Figure 1.

Figure 1

Radio Communications Intertie



III. ENTOMOLOGICAL PLAN
SAMPLING PROCEDURE AND DATA ANALYSIS

The following sampling procedures will only be used within the areas presently approved for DDT treatment throughout the three-state area for tussock moth control in 1974. The purpose of this plan is to establish standard sampling methods so that the treatment effectiveness data from all units[1/] can be compared. The plan covers sampling methods used to determine:

1. Spray block release.
2. Measuring population survival.
3. Assessing foliage saved.
4. Measure numbers of egg masses in the fall following treatment.
5. Success of treatment in terms of preventing top kill and tree mortality.

1/ Appendix No. 14 is a Glossary of Terminology used in this sample plan.

Data analyses are also included for all sampling systems.

Some of the more important terms used in this plan are listed and defined in Appendix No. 14 so that the meaning of the usage of a word will be clear to all personnel engaged in carrying out the objectives of this plan.

Sampling Procedures

1) Spray Block Release Criteria

Release of spray blocks will be determined by establishing three or more egg hatch plots in each spray block. The egg hatch plot locations should be distributed throughout the block to include the various aspects and elevations present. New egg masses will be located on the lower crowns of open grown trees within eye level for observation. Each plot will consist of 20 new egg masses but not more than three egg masses per tree will be tagged. A paper tag designating spray block, egg hatch plot, and egg mass will be placed near as possible to each selected egg mass as shown in Appendix No. 15. The location, elevation, and aspect of each plot will be recorded on the Egg Hatch Development form at the time of establishment (Appendix No. 16).

Egg hatch plots will be established before May 25 and observed intermittently after budburst until the criteria of egg mass hatch has been reached. After egg hatch has begun, daily observations will be necessary and recorded on the Tussock Moth Egg Hatch field form (Appendix No. 17). These observations will be summarized and recorded on the Egg Hatch Development Record (Appendix No. 16).

If spray blocks do not have access, data from predetermined similar blocks will represent inaccessible areas. This data from two or more blocks may be pooled to represent blocks which are inaccessible.

Spray blocks will be released for spraying by the unit entomologist three days after 70 percent of the egg masses in a given block have started to hatch. The form provided (Appendix No. 18) will serve as the official notice.

2) Measuring Population Survival

To determine the most desirable sample size in a three-stage survey (clusters, trees, branches) a sample of thirty-six 10-tree clusters from the prespray data from the 1973 insecticide tests in Oregon, Washington, and Idaho was put into the computer program, MUST (Hazard, 1974). This program utilizes the variance between branches, trees and clusters with their respective costs to calculate the optimum sample size for each sample stage. A sample of postspray data was also used to select optimum sample size for postspray sampling. Development of the sampling plan is shown in Appendix No. 19.

Based on estimated variances and sampling cost, the following sample plan will be used for each control unit:

Sample size per control unit	
75	Total clusters
15	Clusters in untreated areas
60	Clusters in treated areas
3	Trees per cluster
2	Branches per tree prespray
4	Branches per tree postspray

Survival measurements will be based on one prespray and two postspray sampling periods on check and spray areas. It is very important that both untreated and treated clusters be examined and evaluated under the same criteria. This means that egg hatch plots must also be located near the untreated clusters and that all prespray and postspray examinations be made on the same schedule as if they were sprayed. The dates will be recorded on the cluster schedule, Appendix No. 20.

Establishment of cluster location - Clusters within each unit will be established before May 30. Cluster locations will be based on a random selection of points. In order to insure that all subunits are sampled, a stratified random draw of sample points will be selected from a table of random numbers with allocation proportional to the size of the subunits.

The first step is to establish a systematic grid of points across the proposed spray areas with each point being numbered consecutively 1 .... n (several hundred). The percent of points within each subunit will be determined and applied to the 60 clusters recommended for each unit to establish the proportion of clusters to be located within each subunit. Randomly selected points can be moved to the nearest road to accommodate sampling. Check plots will be established in areas not being sprayed but otherwise meeting spray criteria in a random manner as described above.

Description of sample trees - Sample trees are defined as Douglas-fir and grand fir 30 to 50 feet tall. This height limitation is used because midcrown samples are limited to this tree size with available pole pruners. Sample trees should be open grown and not overtopped by larger trees. They must have sufficient foliage to support high tussock moth population and not have more than one-fourth of the top crown defoliated. Sample trees will be marked with a paper tag as shown in Appendix No. 15.

Population sampling - Douglas-fir tussock moth larval populations will be sampled within a 72-hour period prior to spraying and at 4 and 21 days after spraying. If the block is not sprayed because of rain, etc., within the 72-hour period, another prespray sample will be taken. A branch sample from the midcrown portion of the sample tree will be taken by extending a pole pruner with catch basket and clipping approximately the distal 18 inches in such a way that it falls into the basket. Two branches from opposite sides of sample trees will be taken at the prespray sample period,

and four branches at the postspray sample periods. Care should be taken to avoid disturbing other branches which may be selected at a later sampling period. Branch samples and all contents of the basket will be carefully placed on canvas tarps 4 by 4 feet for larval counting and branch measurement.

The following information will be recorded at each tree on the Population Data Sheet (Appendix No. 21).

1. Date
2. Control unit
3. Spray block
4. Cluster number
5. Tree number
6. Branch length (length of foliated area)
7. Branch width (width measured at right angles to length)
8. Number of tussock moth larvae
9. Other Lepidoptera (optional unless numerous)

The basic unit of measurement will be the mean tussock moth larvae per 1,000 square inches of foliage per cluster and calculated by using the following formula:

$$\text{Sq. in. foliage} = \frac{(\text{Length}) \times (\text{Width})}{2}$$

$$\text{Larvae/100 sq. in.} = \frac{(\text{No. of Larvae}) \times (1000)}{(\text{Square in. foliage})}$$

3) Assessing Foliage Saved

Two methods will be employed to measure the amount of foliage saved by treatment. One system will involve a visual classification by crown level, and the other actual measurements of damaged needles on new growth only.

Crown classifications - In each unit the same trees will be used for both population and foliage evaluations. Prior to feeding or egg hatch, each sample tree will be rated as to degree of defoliation present, and again after all feeding has been completed. This will be accomplished by first dividing the crown of the tree into six equal levels using a 6-inch ruler as a guide. Each crown level is then observed and evaluated individually. Both old and new growth will be rated separately using the following intensity code. The same qualified person will rate trees for both prefeeding and postfeeding examination. The prefeeding rating would normally be done when trees are selected.

Defoliation Intensity Code

0 - No feeding visible.

1 - Less than 50 percent defoliation.

2 - More than 50 percent defoliation but less than 90 percent.

3 - More than 90 percent defoliation.

The ocular defoliation indexes for old and new growth will be their respective numerical value for all six crown levels. This rating system can be converted and related to other systems now in use. The data for each tree will be recorded on the Crown Classification field form (Appendix No. 22). The prefeeding rating for 1974 foliage will be 0 for all trees.

New growth damage assessment - At each of the three sample periods the distal five shoots from each of the two branches on which the population has already been measured will be saved. These branch tips will be placed into a paper bag and labeled as to cluster and tree number. The foliage is then examined in the laboratory under magnification to determine the ratio of damaged to undamaged needles. The examination will be done within 24 hours after collecting. The underside of each needle will be examined to determine the number which have been damaged and those remaining undamaged. A damaged needle is one which has been fed upon. This information will be recorded on the Foliage Assessment Laboratory Form (Appendix No. 23).

4) Fall Egg Mass Sampling

In the fall after eggs are laid, four whole midcrown branches from the same sample trees will be removed and examined for new egg masses. The foliaged branch length and width will be recorded. The number of tussock moth egg masses on the total branch including the stem will be recorded on the Population Evaluation Data Sheet (Appendix No. 21). The number of egg masses per 1,000 square inches will be calculated for each cluster.

5) Tree Mortality Top Kill

As a separate evaluation the impact plots that were established in Oregon and Washington in 1973 will be used to determine impact of tussock moth on the timber resource (R-6 Impact Study Plan, 1973). These impact plots, plus additional plots to be established in 1974 outbreak areas, will be used to evaluate effectiveness of DDT in preventing growth loss, tree mortality, and top kill. The first stage of sampling consists of eighteen 6-mile photo strips taken with color infrared film at 1:4000 foot scale across randomly selected damage areas. Each photo strip or impact plot was subsampled to establish ground truth. Defoliation intensity and timber stand data was collected using variable plot cruising techniques. These impact plots will be reflown and field data collected in 1974 and again in 1977 (1975 and 1978 for plots established in 1974). A stratified random sample of trees will be examined over all damage classes, diameter ranges (0.5-inch increments), and tree species. These trees will be felled and growth data collected at d.b.h. and one-fourth bole length sections. Top kill and relative tree vigor data will also be collected.

In addition the 40 impact plots in Idaho that were established in 1973 can be stratified into treated and untreated strata and compared to determine if differences in top kill or mortality occur.

Data Analysis

Various kinds of data will be produced by the sampling efforts in this control project. Some of these are:

1. Estimates of prespray and postspray larvae populations for each cluster and unit. The estimates of population density will be made from population counts expressed as number of larvae-pupae per 1,000 square inches of foliage. Percent control can be computed using Abbott's modified formula which takes account of unequal sample size.

Abbott's Formula

$$Y = 1 - \frac{TAA \times CAB}{TAB \times CAA} \times 100$$

where Y = percent control

TAB = prespray population treatment mean

TAA = postspray population treatment mean

CAB = prespray population control mean

CAA = postspray population control mean

2. Estimate of mortality (population response to control spraying) by ratio estimation; e.g., the survival rate is given by:

$$r_i = (X_{2i}/Y_{2i}) / (X_{1i}/Y_{1i})$$

where r_i = survival ratio for the ith cluster

X_{1i} = prespray population count for ith cluster

X_{2i} = postspray population count for ith cluster

Y_{1i} = prespray square inches for the ith cluster

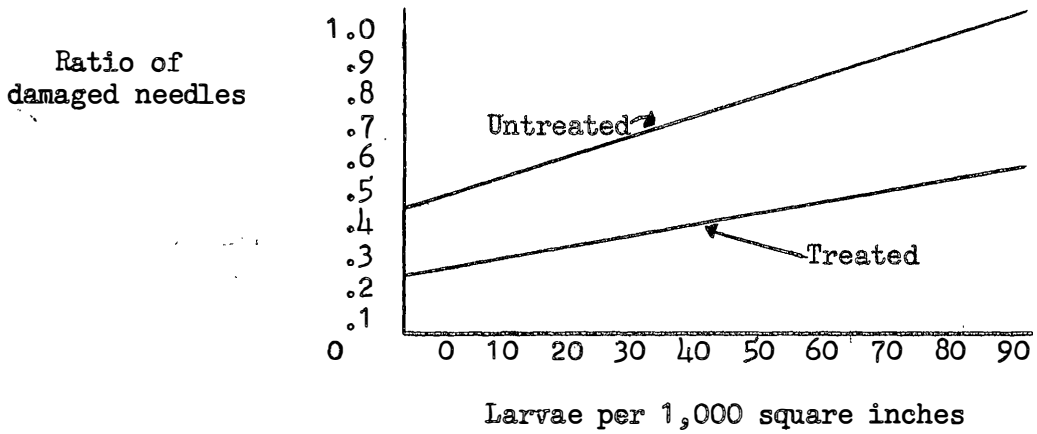
Y_{2i} = postspray square inches for the ith cluster

Survival ratios will be used rather than percentage reduction per se so as to provide a comparison on the same basis as actual survival counts. Uncorrected percent mortality would equal $(1-r_1) \times 100$.

3. Data obtained from the prespray population estimates and the crown classification ratings will be used in multiple covariance analysis to test for differences between treated and untreated areas. The two independent variables in the multiple regression will be the respray population (X_1) and the prefeeding cumulative tree index (X_2). The two dependent variables will be defoliation index after feeding, on old foliage (Y_1) and on new foliage (Y_2).

4. Using data obtained from branch samples examined in the laboratory, covariance analysis will also be used to test treatment effect on new foliage saved. In this case, the prespray population will be the independent variable X_1 and the dependent variable would be the ratio of undamaged needles Y_1. Covariance analysis between treated and untreated prespray data should show no significant differences in either intercept or slope, whereas the same analysis of the first and second postspray should show significant differences

in intercept and perhaps slope if the treatment was successful in saving foliage. An example of the 21-day regression might appear as:



5. Regression coefficients of relative growth loss on tree diameter for each defoliation class will be applied to stand tables developed from the variable plot data. These observations will be used in an analysis at variance to test differences among treatment means, defoliation classes, and tree species. If desired, an analysis of co-variance can be used to test differences in regression slopes between defoliation classes and tree species.

6. Data transformation may be necessary either arcsin or logrithmetic if relationships are not linear.

Data will be summarized daily at the unit headquarters and a Xerox copy made and sent to respective Regional or State offices.

IV. AIR OPERATIONS PLAN

Qualified Personnel

Helicopter Pilot. Pilots used in aerial application shall:

1. Possess a currently valid commercial pilot certificate with appropriate ratings for the aircraft and the mission.

2. Have sound judgment, stable temperament and other character traits essential to competent operation of aircraft under unusual conditions. (The pilot has the responsibility of making the final decision on all aircraft missions).

3. Possess the ability, attitude and willingness to accept and perform the duties and responsibilities of a pilot in a satisfactory and efficient manner.

4. Have additional specialized experience as deemed necessary, such as mountain and agricultural flying.

5. Demonstrate competence in planning and supervising certain phases of air operations and training ground support crews.

6. Furnish references concerning recent experience and performance.

7. Hold valid State aerial application certificates as required for insecticide application issued by the State where spraying will be accomplished.

8. Be familiar with the specifications and requirements as listed in the contract.

The following minimum flying experience is required:

Experience	Flying Time as Pilot in Command (helicopters) Hours
Total (including the following)	1500
Night	10
Typical Terrain	200
Weight Class	100
Make and Model	50
Make and Model, preceding 60 days	10
Make and Model, preceding 30 days	5

Aerial Observer. The person responsible for directing aircraft in the spray block areas should be familiar with aircraft, should not be subject to air sickness and should have the following skills and knowledge:

1. Knowledge of air-ground relationship to aerial application.

2. Qualifications as an observer.

3. Knowledge of the capabilities and limitations of aircraft and aerial application of techniques and procedures.

4. Knowledge of communications procedures.

Heliport Manager. A heliport manager is required at each heliport that is used as an operating base. He is responsible for all ground service operations at his assigned base. He should have knowledge of the following:

1. Aerial application organization.

2. Aircraft limitations and capabilities.

3. Aircraft traffic rules and procedures.

4. Heliport facilities, supply personnel, and equipment needs for air operations.

5. Communications procedures.

6. Records and reports needed.

7. Safety procedures around aircraft and pumping equipment.

8. Procedures and techniques of aircraft loading.

Suitable Aircraft

Aircraft selected for aerial application project shall meet FAA requirements, State requirements and contract specifications, and have the performance characteristics to accomplish the mission safely and efficiently over steep and rugged terrain.

Communications

Radio. Good air-to-ground and air-to-air radio communications are essential for efficient and safe operations. Communication requirements are as follows:

Spray helicopters shall have installed as a minimum one 90 channel VHF communications transceiver and will communicate with the observation aircraft on VHF. Frequency assignment will be made during the pre-spray briefing.

Observation helicopters shall have as a minimum one 90 channel VHF Com Transceiver and will communicate with the spray helicopters on VHF. They will have facilities for installation of a Forest Net radio for communications between the observation aircraft and the Air Operations Chief.

Helicopter managers will use U. S. Forest Service ground net for communications with the Air Operations Chief and unit headquarters.

Ground Support Facilities

Heliports. Each operating base should have heliport pads large enough for safe operation, with unobstructed departure and approach lanes. Fire and rescue equipment should be immediately available.

The heliport must have an adequate helicopter loading area. This should include adequate space for pumping equipment and storage for spray mixtures. Also necessary are space and equipment for fueling, servicing and maintaining helicopters. Each heliport should also have the following:

1. A standard R-1 heliport kit (M-25) which would provide the necessary materials for roping and flagging the heliport, no smoking signs, heliport signs, safety vests, windsock, ear plugs, safety goggles, manager's kit and a stokes litter with cover and liner.

2. A sheltered area with a table and chair for heliport managers use to complete necessary paper work and store communications equipment and necessary supplies.

3. Adequate motorized vehicle parking area so as not to obstruct or interfere with helicopter operating area.

4. Adequate lighting should be provided for safe loading and maintenance at the heliports.

5. A crash kit with the following items:

   1 hack saw with extra blades
   1 stokes litter (if provided with the heliport kit, an additional one is not needed)
   1 large first-aid kit
   1 large crow bar, 36"
   1 five axe or pulaski
   1 shovel
   1 5 lb. extinguisher
   1 wool blanket
   1 large bolt cutter

V. PROJECT JOB DESCRIPTIONS AND RESPONSIBILITIES

FIELD STAFF OPERATIONS

Project Director

I. Overall Coordination:

A. Liaison with Region 6 for the project on the Craigmont Unit; with Region 4 for the project on the Sawtooth Unit; with the Panhandle and Clearwater National Forests; with the U. S. Forest Service Microbial Field Test Projects on the Coeur d'Alene and NezPerce National Forests; with the State Land Commissioner and Regional Forester; with the Bureau of Indian Affairs and Coeur d'Alene Tribe.

B. Serve as contact and liaison with private landowner groups and the Forest Pest Action Council; with other public and private agencies.

II. Coordination and direction of the project through the Assistant Project Supervisor in consultation with the Administrative Officer, Safety Officer, Security Officer and Information and Education Officer.

Assistant Project Director

I. Direction and supervision of field operations; directs coordination of project needs and efforts developed in consultation with the Entomology Chief, the Air Operations Chief, Meteorology Chief and Communications Chief.

A. In consultation with the Project Director, prepares plans of all pre-operation planning and training, execution of operations, and post-operation jobs, monitoring and demobilization.

B. Supervises cartographic person to delineate spray blocks, excluded areas, meadows, live streams, lakes and ponds and agricultural lands for Air and Entomology Chiefs and Pilots. Supervises Equipment Officer so that all field office and field equipment with auxiliary fuel and service needs are functional. Designates responsible party to maintain telephone and radio log at Headquarters so that occurances of significant events are noted in project log. Fills out daily progress reports and Spray Block Certification Forms.

II. Executes project functions of Administration, Safety, Security and Information and Education requested by the Project Director by direction to the Chiefs of Communications, Air Operations, Entomology and Meteorology.

Administrative Officer

I. Advises Project Director of project administrative needs and problems. Directs clerical, accounting and secretarial persons for State and U. S. Forest Service on record keeping, purchasing, time keeping, accounting and historical records so all facts of project activity may be retrieved for preparation of project report and/or study.

Safety Officer

I. Advises Project Director on all aspects of project safety. Supervises field inspection and observation of project air and ground operations and immediately notifies Assistant Project Director of any unsafe activity or potential safety hazard, with written follow-up to Project Director. Prepares and presents pre-operation safety training sessions.

II. Prepares plan for investigation of any serious accidents involving lost time injuries and pesticide spillages or jettisons.

Security Officer

I. Advises Project Director of matters pertaining to security and protection of project personnel, equipment, and materials from illegal or unauthorized tampering, violence or interference. Directs activities of Deputy Security Officer and mobile unit.

II. Assist Air Operations Chief to develop security plan and train Watchmen or other security at heliports. Coordinate with Safety Officer.

III. In coordination with Safety Officer executes spray block access restrictions and posting of warnings in spray blocks.

Information and Education Officer

I. Advises Project Director of needs and activities in information and education before and during the project.

A. Prepares and executes an information program to inform and answer questions from forest landowners, news media and other interested groups.

B. In coordination with Project Director, State Forester and Regional Forester, prepares informative and timely news releases which will require pre-project preparation of format to release current news.

FIELD LINE OPERATIONS

Communications Chief

I. Provides and coordinates the project needs for radios, State and U. S. Forest Service, both aircraft and ground net; arranges for round-the-clock radio service; provides for any additional telephone installation; all under direction of the Assistant Project Director.

Air Operations Chief

I. Supervises the air operations phase of the spray project. Prior to project operations, plans assignment of aircraft, selection of heliports, pesticide delivery and storage at the heliports, security and safety of heliports, in consultation with Entomology Chief, Assistant and Project Directors. During the project, executes the air operations plan.

Air Operations Chief Cont'd

A. Trains and supervises the Heliport Managers and security personnel in safe and secure heliport operations.

B. In cooperation with the Entomology Chief and Meteorology Chief carries out a plan of insuring pesticide quality and quantity, calibration of delivery systems; maintains daily logs of loading and spray block deliveries, securing samples of pesticide for post-operational quality analysis.

II. Prior to and during operations, supervises the Observation Aircraft, coordinating spray delivery and recording of spray progress on operations maps with the Chiefs of Entomology, Meteorology and the Assistant and Project Directors.

III. Supervises the operations of the spray aircraft. (Liaison with Contractors)

A. In case of application error or jettison of pesticide by delivery aircraft, makes immediate report to Assistant Project Director with detailed written report follow-up within six hours.

Assistant Air Operations

I. Assists Air Operations Chief in all details of air operations. Handling of pesticide quality samples, loading records, daily logs of heliport activities, mapping of spray delivery progress and planning.

Air Operations Specialists

I. Two specialists will be assigned to provide on-the-spot training at heliports in all phases of helicopter operations. They will work with the project Safety Officer and help correct any unsafe practices. They will also work with the Security Officer to provide security and protection of equipment and personnel. They will provide assistance to the Heliport Managers and provide the practical training phases that are not available in the classroom.

Entomology Chief

I. Prior to project operations, plans in conjunction with Assistant Project Director assignments and delineation of spray blocks, excluded areas on project maps; assignment of Pest Development and Population Monitoring Crews; also Spray Deposit Monitoring Crews; safety of field monitoring activities; proper recording of data; in coordination and consultation with Communications, Air Operations and Meteorology Chiefs and Project Director.

A. Trains and supervises the field monitoring crews.

B. In cooperation with the Air Operations Chief and Meteorology Chief, carries out a plan of insuring pesticide quality, spray deposit and quantity, progress mapping and pest control coverage in spray blocks.

Entomology Chief Cont'd

II. In consultation with Project Director serves as liaison and advisory to pesticide monitoring agencies.

Assistant Entomologist

I. Assists Entomology Chief in all functions outlined above.

Meteorology Chief

I. In consultation with Staff Officers and Line Chiefs, prepares a program of weather forecasting and monitoring. Provides spot weather forecasts eight hours prior to spray operations for each series of spray blocks scheduled on the following day.

A. Distributes written copies of the spot weather forecasts to Line Chiefs for use at sunrise.

B. Trains and supervises weather observers. Provides immediate notification to Air Operations Chief when weather factors reach levels for daily suspension of spray operations.

C. Keeps permanent log of meteorology activity and action.

Equipment Officer

I. Under supervision of Assistant Project Director. Assists Assistant Project Director in assignments of quarters, office and field equipment, including radios, fuel and service of machines and as needed by Assistant or Project Director.

Heliport Managers

I. Two Heliport Managers will be assigned to each heliport. One will be designated as leader and the other his assistant. They will oversee the operations on the heliport such as loading, refueling, personnel safety and security. Keep up-to-date records on pilot's flight time, daily logs of loading and spray block deliveries. They will receive practical and technical assistance from Air Operations Specialists whenever needed.

Pest Development and Spray Deposit Foreman

I. Under direction and supervision of Entomology Chief.

Weather Observers

I. Under direction and supervision of Meteorology Chief.

Aerial Observers

I. They will monitor spray block coverage and may be used to time actual spray boom operating time to verify proper calibration. They will provide communications link between spray helicopters and Air Operations Chief.

Aerial Observers Cont'd

They will observe and report any unsafe flying practices to the Air Operations Chief. They will keep the spray helicopter pilot alerted to any obstruction or unusual happening that may be a hazard to the pilot or helicopters.

Woodland Foresters (WF Orofino, Moscow)

I. Under the direction of Information and Education Officer; assist in assigned zones in informing and advising landowners, scouting sensitive and exclusion areas prior to and during operations.

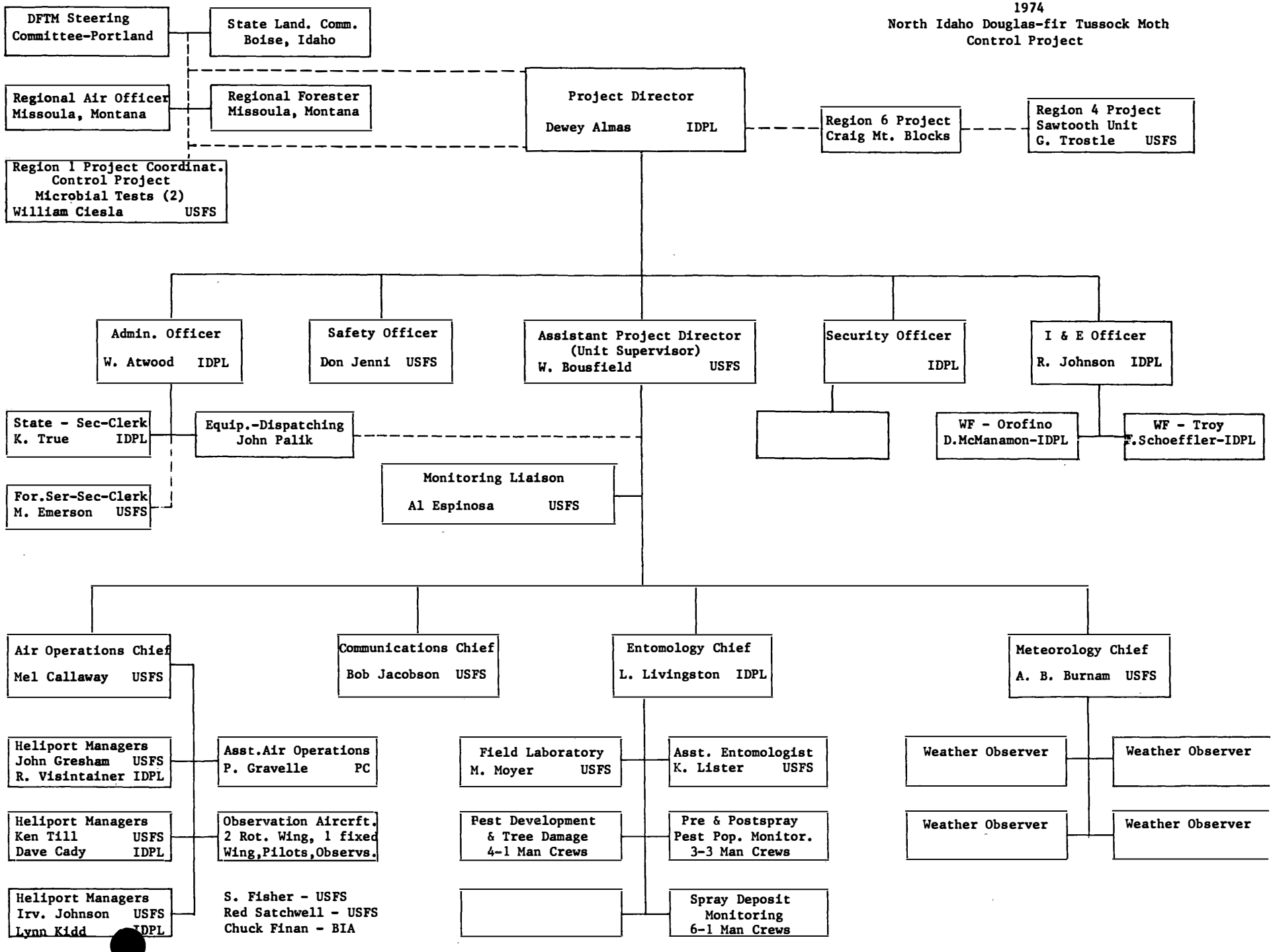
II. Serve as special liaison or performing unexpected duty needs which may arise.

All Other Personnel (Not Described Above)

I. Under direction and supervision of Officer or Chief in charge of function.

See Page 24 for Organization Chart.

1974
North Idaho Douglas-fir Tussock Moth
Control Project



VI. SAFETY PLAN

I. Preface

This plan is written to provide firm guidelines for the people responsible for the safety program to instill a safety-conscious attitude in every employee and make each realize that it is his responsibility to work safely.

The Forest Service Health and Safety Code clearly spells out safety responsibilities for all work supervisors and individuals. Be sure that you and the people you supervise thoroughly understand and meet those responsibilities.

The cooperative project will provide: accident-free working conditions; supervisory personnel who will insure that all personnel are trained to do their jobs safely; safe equipment; first-aid equipment; and time required to make every job safe.

In case of accident, no matter how minor, forms will be made out depending upon which agency has responsibility.

A. Project Director. The entire safety program is the direct responsibility of the Project Director. The Project Director or his representative will investigate all accidents.

B. Project Safety Officer. The Project Safety Officer is responsible to the Project Director for implementing the project safety program.

C. Relationship of the Contractors to the Safety Plan. Contracts for aerial spraying, insecticide and spray formulation include provisions for safeguarding this operation. The Contractors, through agreement to the terms of the contract, will be subject to these safety provisions. In addition, the details of the safety plan will be discussed with the Contractors to gain mutual understanding.

II. Goals for this Project

A. No fatalities.

B. No lost time accidents.

C. No vehicle accidents.

D. Hold the number of minor accidents to a minimum.

III. Action Program

A. Heliport and spray operations.

1. The insecticide and carriers used may be hazardous if swallowed, inhaled or absorbed through skin. Washing facilities shall be provided at each active heliport to be used for flushing insecticide from the skin.

2. Notice of the project will be given to doctors and hospitals in the area and the Poison Information Center for this area located at Deaconess Hospital, W. 800 - 5th Avenue, Spokane, Washington.

3. A wind indicator will be placed at all heliports.

4. Takeoff and landing pattern established for a heliport shall be used by spray and observation craft.

5. Spectators will be restricted from loading areas.

6. Adequate lighting should be provided for safe loading and maintenance at the heliports.

7. A crash kit for emergency use will be kept at each active heliport.

8. Helicopters shall be cleaned of overflow insecticides and of fuel.

9. NO SMOKING within 50 feet of any refueling or insecticide equipment. A smoke break area will be designated at each heliport.

10. The Air Operations Chief will be especially alert to prevent overloading of all aircraft.

11. A minimum of 30 minutes reserve fuel over the estimated amount required for each flight shall be carried in spray and observation helicopters.

12. All personnel shall stay clear of tail boom or tail rotor.

13. DO NOT approach the helicopter until the pilot signals you to do so, and then from the side and front in full view of the pilot--KEEP YOUR HEAD DOWN.

14. The Air Operations Chief and the spray pilots must take the responsibility for locating and identifying all potential flying hazards such as radio towers, power lines, tall snags, etc.

15. Spray planes will not carry passengers while spraying.

16. Spray plane pilots will wear safety belts and crash helmets.

17. Helicopter windshields shall be clean at all times.

18. Spray helicopters will not load with insecticide after operations are suspended for the day.

19. Pilots using unsafe practices will be grounded.

20. Strike-anywhere matches will not be carried by pilot or passengers on flights.

21. The pilot may cancel any flight when he believes existing or pending conditions make it unsafe.

22. Observation helicopter pilots and observers shall wear seat belts.

B. Heliport Managers shall:

1. Be made aware of the hazards when working around pesticides and gasoline.

2. Observe and enforce safety rules posted at the heliport.

3. Report to spray operations officer immediately all helicopters that are 15 minutes overdue.

4. Be alert to rotating helicopter blades.

5. Wear protective working clothing, respirators, and goggles as necessary.

6. Wash off any insecticide or gasoline which gets on the skin.

7. Change work clothes daily if handling insecticide.

8. Keep visitors a minimum distance of 100 feet from loading area.

9. Provide portable toilets at each heliport.

C. Personnel assigned to field work shall:

1. Be familiar and comply with Forest Service Health and Safety Code, 5.21.

2. Wear logger-type shoes with non-skid soles and a snag-resistant shirt and trousers.

3. Be properly briefed on getting to and from work areas.

4. Carry first aid kits, compasses and pocket knives.

5. Know what to do in the event of becoming lost or injured.

6. Be fully aware of irritative nature of hairs covering the tussock moth. For those people who know they are allergic, be sure to carry your medicine in the field; however, a hot shower will be all that is necessary for most people.

D. Office personnel shall:

1. Observe all safety items as outlined in the Forest Service Health and Safety Code, 8.41.

2. Know procedures to follow in case of an emergency. An outline of proper procedures is posted by the project headquarters radio.

E. Vehicles (Forest Service Health and Safety Code, 2.1)

1. Vehicles, owned or leased by the Forest Service or State of Idaho, shall be driven only by physically fit employees who have qualified for and hold valid federal and/or State of Idaho driver's licenses and who shall be thoroughly familiar with Section 2.1 of the Safety Code.

2. All drivers shall practice DEFENSIVE DRIVING.

3. All 4x4 vehicle drivers shall take extra care not to over-extend the capabilities of this vehicle.

4. Any accident which occurs shall be reported to the employee's immediate supervisor who will take appropriate action.

5. Forest Service vehicles shall not exceed 50 miles per hour.

Any safety program which is developed prior to actual operations should be flexible enough to permit frequent revisions as new dangers and hazards are encountered.

It will take constant alertness to recognize the hazards and very close supervision to see that training is carried out as planned and that work supervisors actually check and double check every operation.

IV. Heliport and Spray Operations.

In addition to the safety procedures listed in the Project Spray Work Plan, the following will be adhered to:

A. Helicopter engines will be shut down during refueling operations.

B. Helicopters and service trucks will be grounded during refueling operations.

C. Heliports shall be kept clear of any loose objects that may be a hazard to helicopters and personnel.

D. Personnel working on heliport should protect their vision by wearing safety glasses.

E. When two or more helicopters are using the same heliport, the pilots will coordinate between themselves and establish a safe traffic pattern when approaching or departing a heliport.

F. Observation helicopters will maintain a flight altitude that is high enough to provide the observer a clear view of the spray helicopter and not create a hazard to the spray operation.

G. All helicopter pilots and observers shall wear protective helmets equipped with earphones and a boom microphone.

H. All helicopter pilots and observers shall wear seat belts and shoulder harnesses.

I. All pilots will observe the flight hour and duty hour limitations as stated in the spray contract and FSM 5700.

J. Helicopter loading, based on FAA Standard Category Certificated Gross Weight, will be determined from the applicable performance chart in the helicopter flight handbook, using pressure altitude and temperature at the heliport.

K. Spray helicopters will not be permitted to carry passengers except for authorized Forest Service aircraft and pilot inspectors.

L. Heliports shall be properly flagged and signed with the equipment provided in Heliport Kits.

V. Search and Rescue for Aircraft

The following outlined procedures are to be used in case of a down or missing helicopter. This plan can be modified as needed with approval of the Project Director.

A. General

1. All personnel will carry a copy of ground-to-air visual signals.

2. Emergency telephone numbers are listed at the end of this section.

B. Preventative measures

1. Each spraying helicopter will be assigned a specific spray block which will be recorded with the Heliport Manager. Any side trips must be approved by the Heliport Manager.

2. Helicopters shall carry 30 minutes extra fuel on each trip.

3. Departure and return time will be recorded.

4. Spray craft will jettison load if in serious trouble. Pilot will report jettison location and make a written statement of the fact to the unit supervisor.

5. There should be a vehicle present at each active heliport to serve as an ambulance. (Equipment: radio, first-aid kit, fire extinguisher, stretcher and fire tools: that is crash kit.)

C. Search Plan

1. If a helicopter is missing, overdue, or down, the Heliport Manager will contact the spray operations officer and headquarters through the observation helicopter. As much detail on the last known position of the missing helicopter, spray block and normal route of flight to and from the heliport should be determined and made available. If the Air Operations Chief cannot be reached in a short time, the Project Director or the Safety Officer will conduct the search and rescue operation.

2. The observation helicopter will first make a visual scan of the air for the missing helicopter in the spray block area. Radio failure may be the only problem.

3. The observation helicopter will start an intensive search of the subspray block for the possible crash site. Continuous radio contact will be maintained with the Heliport Manager.

4. If unable to locate the missing craft immediately, the Air Operations Chief will notify the Project Director and then determine the area to be searched and the helicopters to be deployed for the search.

5. Project headquarters will contact the following in case of a serious emergency:

   a. Idaho State Board of Aeronautics, Federal Aviation Agency, and Civil Air Patrol. (See Emergency Telephone List.)

   b.

Regional Fire Dispatcher	Location	Telephone
Chuck Kern	Missoula, MT	406-549-4181, Ext. 544 406-728-1271 Home
Regional Air Officer		
John Robertson	Missoula, MT	406-549-4181, Ext. 560 406-542-2727 Home
Insect & Disease Branch Chief		
Bill Ciesla	Missoula, MT	406-549-6511, Ext. 3256 406-549-5461 Home
IDPL Asst. Commissioner of Forestry and Fire		
Jack Gillette	Boise, ID	208-384-3280 208-375-0515 Home
Interagency Project Coordinator		
David Graham	Portland, OR	503-221-3601 503-643-2534 Home

c. Alert the appropriate forest supervisor:

Forest	Forest Supervisor	Telephone
Idaho Panhandle	Ralph Kizer	Coeur d'Alene 208-664-8281
Clearwater	Kenneth Norman	Orofino 208-476-4541

d. Notify District Ranger of district involved:

Forest	District	Ranger	Telephone
Clearwater	Palouse	John Galea	Moscow, 882-3557
	Pierce	Thomas Blunn	Kamiah, 935-2513

e. Notify Idaho State Police (Emergency Telephone List).

f. Alert nearest ambulance, hospital and physician (Emergency Telephone List, Appendix No. 27).

g. Alert the medical investigator in case of death (Emergency Telephone List).

D. Rescue Plan (When downed craft is located and reported)

1. Orbiting helicopter will check area for safe landing at or near the site, land, render assistance, and make pickup if possible.

2. Ambulance may be ordered to nearest designated emergency location if patient cannot be removed by helicopter.

3. Doctor will be standing at designated emergency location for transportation by helicopter if necessary.

4. Rescue team will inform spray operations officer and headquarters of crash victim's condition.

5. Project Director, Public Lands State Officer, forest supervisor and Regional Office will be informed of progress at all times.

6. Division of Information and Education will be requested to advise on release of information.

7. In case of a fatality notify the medical investigator.

8. In case of a fatality the employer will notify next of kin.

9. An accurate log of search and rescue operations will be kept by headquarters.

10. Collect names and statements from all witnesses.

VII. INFORM AND EDUCATE ACTION PLAN

There will be two major aspects of this phase of the project; to work with and provide information for private landowners within the infestation area, and to provide information to the general public.

Private Landowners

Plans will be implemented to assure that private landowners are aware of the proposed control project and the areas where insecticide will be applied. Also, means will be provided whereby landowners can be assured that all areas meeting the spray criteria are included in the spray boundary and that sensitive areas are avoided. These objectives will be accomplished by a minimum of the following items:

1. A letter of explanation (Appendix No. 24) will be sent to those individuals owning land within the tussock moth infestation boundary.

2. Maps showing the proposed treatment areas will be posted for review by the public. They will be placed in offices of the Forest Service and State agencies and possibly in other areas open to the public. A notice (Appendix No. 24) will accompany the map listing places to call for further information.

3. A series of public meetings will be held so that landowners can be fully informed of control plans and have an opportunity to ask questions. These will be held in the following cities:

Coeur d'Alene	Troy
Plummer or Tensed	Moscow
Potlatch, Princeton or Harvard	Grangeville
Orofino	St. Maries

   Appendix No. 25 is an agenda for the meetings. Notice of the meetings will be printed in local papers and posted in public areas.

4. A method of contact for the public whereby their land will be surveyed if they think tussock moth is present but they are not included in the spray boundary (may be part of Item No. 1).

5. A special letter will be sent to those holding state and federal cattle grazing permits in the project area advising them of the proposed action and reminding them of potential DDT residue problems as they pertain to marketing. A notice with the same information will be sent to the local newspapers.

General Public

News releases will be made periodically to inform the public of progress on the project. Copies will be distributed to agencies in the following towns and areas:

Spokane - Chronicle	Coeur d'Alene - Press
St. Maries - Gazette	Potlatch - U.S.F.S.
Troy - Woodland Forester	Moscow - Idahonian, John Galea

Agencies Cont'd

State Area Supervisors	U.S.F.S. Regional Office
U.S.F.S. Ranger Stations	Local Radio Stations
Congressional Delegation	State Delegation

During the first week of the project, the Information and Eduation Officer will maintain an office at the headquarters location. He will take pictures periodically to cover various phases of the operation including actual spraying, monitoring, etc., and prepare displays and press kits as needed. Workload during the project will determine manpower needs. Fact sheets with appropriate photos will be prepared in advance of spraying for distribution as needed. A schedule of VIP visits will be prepared and show-me trips will be conducted accordingly. Most on-the-ground tours will be handled by the Information and Education Officer. After spraying, media will be encourage to report research activities, monitoring activities and results.

In the event that a serious accident or injury occurs during the project, Information and Education activities will be conducted in the same manner as in fire information. For example, in case of loss of life, information will not be given regarding personnel pending notification of next of kin.

VIII. ENVIRONMENTAL MONITORING

An extensive monitoring effort is being planned to assess the effects of the proposed action on the environment. This work is being coordinated by a three-state committee. In Idaho the State Department of Environmental and Community Services is taking the leadership in this effort with cooperation from the Departments of Fish and Game and Agriculture. Coordination between the control project and the monitoring project will be maintained through the Project Director and Project Entomologist.

IX. FINANCING

U. S. Forest Service-State of Idaho cooperative pest control agreements provide for reimbursement of fifty percent of costs to the State for approved Insect and Disease Control projects. The basic legislation for this cost sharing is the 1947 Federal Pest Control Act. State-U. S. Forest Service "Work-Financial Plan" annual agreement 20-67 provides for insect suppression on a cooperative basis.

Idaho Code Annotated, Chapter 38, Section 408, provides that....five percent of all monies hereafter collected for disposal of logging slash for the reduction of fire hazard shall be allocated to a special account for forest insect and forest pest abatement and control....and shall be deemed to be the contribution of the owners of private lands to the abatement and control programs....

Because of insufficient reserves in the pest control and abatement fund the state legislature has passed an emergency appropriation for tussock moth control.

The estimated project cost based on a total of 57,608 acres is $421.350. The U. S. Forest Service share will be about $106,422, for National Forest, other federal and Indian lands and about $157,454 for matching costs on State and private lands. The State share for treating State and private lands is $157,454. Estimates used were $4.83 per acre for the control project plus $1.224 per acre for DDT residue monitoring by other State agencies (Trombley, 1974, Appendix No. 26).

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XI. APPENDICES

Appendix Number	Title
1.	Spray Criteria Evaluation Key
2.	Declaration of a Zone of Infestation of DFTM
3.	Contract for Purchase of DDT
4.	Spray Formulation Contract
5.	U.S.F.S. Contract for Spray and Observation Aircraft
6.	Daily Record of Helicopter Operation
7.	Spray Block Summary Sheet
8.	Spray Block Certification Form
9.	Weather Record
10.	Aerial Observation Report
11.	Spray Distribution Record
12.	Spray Block Deposit Summary
13.	Unit Daily Progress Report
14.	Glossary of Terminology
15.	Tag for Identifying Egg Masses for Development Observation
16.	Egg Hatch Development Record
17.	Egg Hatch Field Form
18.	Notification of Release of Spray Blocks
19.	Summary of Analysis Used to Develop Population Sample Design
20.	Cluster Schedule
21.	Population Evaluation Sheet
22.	Tree Crown Classification Form
23.	Data Sheet for Laboratory Foliage Assessment
24.	Letter to Private Landowners
25.	Agenda for Community Information Meetings
26.	Cooperative Idaho-U.S. Forest Service Financial Plan
27.	Emergency Telephone List

DOUGLAS-FIR TUSSOCK MOTH ENTOMOLOGICAL TREATMENT CRITERIA KEY - TO BE USED WITH THE SURVEY PLAN 9/73

1.	No survey data collected in the area [1/]	(6)
1A.	Survey data collected in the area	(2)
2.	No new egg masses on intensity or time plots - Low risk	
2A.	New egg masses on intensity or time plots -	(3)
3.	Egg mass density equal to or greater than 0.1/1000 square inch foliage [2/] - High risk	(7)
3A.	Egg mass density less than 0.1/1000 square inch foliage [2/]	(4)
4.	New to old egg mass ratio 1:1 or greater [2/] - High risk	(7)
4A.	New to old egg mass ratio less than 1:1 [2/]	(5)
5.	Average egg mass count on time plots 15 or more - High risk	(7)
5A.	Average egg mass count on time plots less than 15 - Low risk	
6.	Unsampled areas (sections) adjacent to one or more areas (sections) which equal or exceed the high risk criteria above - High risk	(11)
6A.	Unsampled areas (sections) not adjacent to one or more areas (sections) which equal or exceed the high risk criteria above - Low risk	
7.	Virus level equal or greater than 50% - Low risk	
7A.	Virus level less than 50%	(8)
8.	Area (plot) located in defoliation class I or II - High risk	(10)
8A.	Area (plot) located in defoliation class III or IV	(9)
9.	Virus level equal or greater than 30% - Low risk	
9A.	Virus level less than 30% - High risk	(10)
10.	Viable egg density in sampled areas less than 20 eggs per 1000 square inches foliage - Low risk	
10A.	Viable egg density on sampled areas, equal or greater than 20 eggs per 1000 square inches foliage - High risk	
11.	Unsampled area adjacent to an area meeting the high risk criteria <u>after</u> the virus and viable egg levels have been determined - High risk	
11A.	Unsampled area not adjacent to an area meeting the high risk criteria <u>after</u> the virus and viable egg levels have been determined - Low risk	

Low Risk = control not necessary for these areas
High Risk = control will be recommended for these areas

1/ Usually a land section of approximately 640 acres in size, but can be smaller if necessary in order to determine treatment needs more precisely.

2/ Determined from either egg mass intensity plot or time plot data.

MEMO TO THE STATE LAND BOARD

SUBJECT: Declaration of a zone of infestation of Douglas-fir Tussock Moth, superseding the Memo of February 19, 1974.

EXPLANATION: Pursuant to Section 38-602 ICA, it is requested that the Board approve a declaration of the existence of a zone of infestation of Douglas-fir Tussock Moth covering the described areas listed below.

The Douglas-fir Tussock Moth has been discovered in scattered areas of northern and southern Idaho. Scientific evidence indicates that the Douglas-fir Tussock Moth will most likely grow to epidemic levels in parts of the larger described area and for this reason the larger zone of infestation listed below is desireable.

North Idaho

Twp. 22N, Rge. 1,2&3W & 1,2&3E BM
Twp. 23N, Rge. 1,2&3W & 1,2&3E BM
Twp. 24N, Rge. 1&2W & 1,2&3E BM
Twp. 25N, Rge. 1&2W & 1,2&3E BM
Twp. 26N, Rge. 1&2W & 1,2&3E BM
Twp. 27N, Rge. 1&2W & 1,2&3E BM
Twp. 28N, Rge. 1,2&3W & 1,2&3E BM
Twp. 29N, Rge. 1,2,3&4W & 1,2&3E BM
Twp. 30N, Rge. 1,2,3&4W & 1,2,3,4,5,6,7,8&9E BM
Twp. 31N, Rge. 1,2,3,4&5W & 1,2,3,4,5,6,7,8&9E BM
Twp. 32N, Rge. 1,2,3,4&5W & 1,2,3,4,5,6,7&8E BM
Twp. 33N, Rge. 1,2,3,4&5W & 1,2&3E BM
Twp. 34N, Rge. 1,2,3,4&5W & 1,2&3E BM
Twp. 35N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 36N, Rge. 1,2,3,4,5&6W & 1,2,3,4,5,6&7E BM
Twp. 37N, Rge. 1,2,3,4,5&6W & 1,2,3,4,5,6&7E BM
Twp. 38N, Rge. 1,2,3,4,5&6W & 1,2,3,4,5,6&7E BM
Twp. 39N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 40N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 41N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 42N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 43N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 44N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 45N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 46N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 47N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 48N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 49N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 50N, Rge. 1,2,3,4,5&6W & 1,2&3E BM
Twp. 51N, Rge. 1,2,3,4,5&6W & 1,2&3E BM

South Idaho

Twp. 1N, Rge. 14,15,18,19&20E BM
Twp. 2N, Rge. 18&19E BM
Twp. 3N, Rge. 11&12E BM
Twp. 4N, Rge. 11&12E BM

Cooperative surveys, natural disease and pesticide test of control and control projects are planned for 1974. Declaration of a zone of infestation will facilitate these surveys, tests and possible control measures.

RECOMMENDATIONS: Approval of a zone of infestation.

Approved by the Idaho State Land Board March 19, 1973

Appendix No. 6
Heliport Manager

IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT 1974

DAILY RECORD OF HELICOPTER OPERATION

________________________Unit Heliport No.____________

Date____________1974 Helicopter No.__________ Pilot________________

Spray capacity____________ (gallons) Swath width__________ (feet) Heliport Manager________________

Load No.	Time off	Time back	Air time	Beginning & end. meter readings	Metered gallons loaded	Cumu-lative total	Spray block No.	Acres/ block
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				
				E: B:				

Helicopter hour meter reading: Begin______________ End______________

IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT 1974

SPRAY BLOCK SUMMARY

Blk. No.	Acres	Date Released	Date Begin Spraying	Date Completed Spraying	Gallons Sprayed	Gal/Ac. Sprayed	Gal/Ac. Depos.	COR	Con-tractor

Appendix No. 8
Assistant Project Director

IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT 1974

SPRAY BLOCK CERTIFICATION

From: COR signature _____

To: Contractor signature _____

Spray block no. _____ with _____ acres has received coverage of

_____ gallons per acre.

It was completed within _____ hours following release for spraying.

Observer _____ indicated coverage is:
_____ satisfactory
_____ unsatisfactory

Treatment of this block is acceptable _____.
Payment will be made for the above acres.

Treatment of this block is not acceptable _____. Reasons are listed below.
This area must be resprayed at your expense.

Appendix No. 9
Meteorologist

IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT 1974

WEATHER RECORD

DATE	LOCATION (¼sec Sec. T R)					SITE NAME	ELEV.	BLOCK NO.	OBSERVER
OBSERVATION TIME	TEMP.	WET	REL. HUM.	WIND DIR.	WIND AVG. SP.	PEAK GUST	REMARKS: CLOUD COVER, SPRAY DRIFT, SMOKE, FOG, SUN LINE, ETC.		FOLIAGE CONDITION

ADDITIONAL REMARKS:

USE 24-HOUR CLOCK TO INDICATE TIME. EXAMPLES: 6:15a.m.PDT = 0615; 10:15a.m.PDT = 1015

Appendix No. 10
Aerial Observer

IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT 1974

AERIAL OBSERVATION REPORT

UNIT_____

1. Spray Helicopter No._____ Pilot_____ Spray Block #_____ Time_____
2. Swath Width_____
3. Spray Plane Height_____
4. Leaks or Plugged Nozzles_____
5. Spray Action & Time Observed_____
6. Spray Pattern Near Non-Spray Areas (lakes, streams, etc.)_____
7. Is Spray Plane in proper block, pilot oriented, etc._____
8. Stop watch time for spraying load:

Spray load No.	Total time per load minutes	seconds	Spray load No.	Total time per load minutes	seconds

Observer_____

Observation Ship No._____

Date_____

Appendix No. 11

Spray Deposit Field Crew
Spray Deposit Card Examiner

IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT 1974

SPRAY DISTRIBUTION RECORD

Unit_____ Spray Block No._____ Line No._____

Pilot_____ Card Examiner_____

Field Crew_____

Date Laid Out_____ Time Laid Out_____ Date Picked Up_____ Time Picked Up_____

Card No. Start_____ Card No. End_____

Card No.	Spray Deposit G/A
TOTAL	

Average G/A_____

Spray Coverage:

_____ Satisfactory

_____ Unsatifactory

Appendix No. 12
Spray Deposit Card Examiner

IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT 1974

SPRAY BLOCK DEPOSIT SUMMARY

Block No.	Acres	Card Line No.	Average Gal/Acre
		1.	
		2.	
		3.	
		4.	
		5.	
		6.	

TOTAL: _____

Average Gal./Acre _____

Block No.	Acres	Card Line No.	Average Gal/Acre
		1.	
		2.	
		3.	
		4.	
		5.	
		6.	

TOTAL: _____

Average Gal./Acre _____

Appendix No. 13
Assistant Project Director

IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT 1974

UNIT DAILY PROGRESS REPORT

Date _____

1. Acreage sprayed today _____
2. Acreage previously reported _____
3. Total unit acres _____
4. Total acres sprayed to date (1 plus 2) _____
5. Acres remaining to be sprayed (3 minus 4) _____
6. Helicopter equipment on the job: _____

_____

_____

_____

Other _____

7. Flying time, spray helicopters Hrs. _____ Min. _____
8. Flying time, observation helicopters Hrs. _____ Min. _____
9. Weather conditions: _____

_____

10. Problems: (Remarks) _____
11. Accidents: (Remarks) _____

_____

12. Remarks: (General) _____

_____

_____

_____

_____

_____

GLOSSARY OF TERMINOLOGY

Douglas-fir tussock moth
Orgyia pseudotsugata (McDonnough)
Tussock Moth
Moth

A moth of the Arctiidae family currently in an outbreak phase over large forested areas of Idaho, Oregon, and Washington. Recently this moth was moved by insect taxonomists from the genus *Hemerocampa* into the genus *Orgyia*.

Caterpillar
Larvae
Worm

The immature stage of the tussock moth. The condition of the tussock moth during the period it feeds on and defoliates the host tree.

Cocoon
Pupae
Resting stage

The intermediate stage between the larvae and adult. The stage where the caterpillar transforms into an adult moth. The cocoon specifically refers to the silken covering of the pupa.

Egg mass

The one cluster of eggs laid by a female tussock moth on the exterior of her cocoon.

Old egg mass

An egg mass laid at least 1 year previously. In most cases the eggs have hatched and the larvae departed. It is easily identified by broken egg shells and the lack of the frothy gelatinous mixture of hairs covering the mass.

New egg mass

An egg mass laid the previous August or September. The eggs are unhatched or may be hatching if the observation is made during May or June. Currently hatching egg masses may be differentiated from old egg masses by the presence of the newly hatched larvae on the egg mass.

Egg mass ratio

The ratio of new egg masses to old egg masses, usually expressed using one as the number of old egg masses. Example: 8 old and 28 new would be expressed as 1:3.5 or simply 3.5. In cases where there are no old egg masses but there are new masses, the ratio is expressed 0:28.

Tussock moth outbreak
Moth infestation
Current outbreak

Terms used to describe the condition in large forested areas of Idaho, Oregon, and Washington where populations of the tussock moths have been during 1972 or 1973 or are currently present in numbers great enough to defoliate host trees.

Units
Outbreak units
Control units

The entire outbreak in Idaho, Oregon, and Washington has been divided into seven areas referred to as units. Divsion of these seven units was based on geographical features.

Units	Location
La Grande	Northeast Oregon
Halfway	Eastern Oregon
Wallowa	Northeast Oregon
Pomeroy	Southeast Washington
Colville	Northcentral Washington
St. Joe	Northern Idaho
Sawtooth	Southern Idaho

Subunit

Geographic contiguous area designated for spray within a control unit.

Spray blocks

A subdivision of a unit, usually several thousand acres in size. This division has been made to consolidate tussock moth populations that will be developing at essentially the same time so the entire block can be treated within 72 hours.

Egg hatch plot

The location of 20 new egg masses in each spray block where egg hatch and bud development will be monitored.

Cluster

Small selected locations of not more than 1 acre within a unit where detailed observations and measurements will be made to evaluate the effectiveness of control measures on three trees. It is the first stage or primary sampling unit.

Sample trees

Individual trees either Douglas-fir or grand fir, 30-50 feet tall with not more than one-fourth top crown defoliated, selected within a cluster on which observation or measurements are made. It is the second stage or subsampling unit within the cluster.

Sample branch

The distal 18-inch branch cut from the midcrown of a tree and is the third stage of the sampling system.

New growth sample

The five terminal new growth tips from branch samples.

Egg mass whole branch sample

The entire branch from midcrown cut at the bole.
Only the foliated portion will be measured for length and width.

Bud flush

Defined as when buds swell to the point of splitting the sheath and exposing new needles to the feeding insects. The bud cap may remain attached for a few days after bud flush.

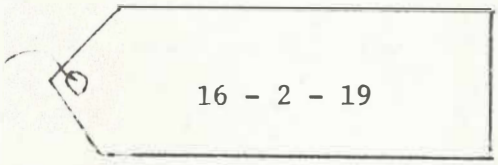
Sample point

An artificial grid point used in the random selection of clusters within units and subunits.

APPENDIX No. 15

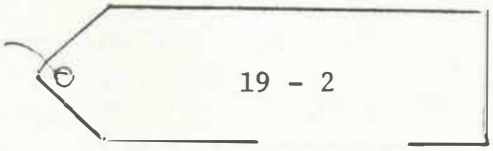
TAGGING TECHNIQUES

Egg hatch plots



Where 16 = spray block number (1 - N)
2 = egg hatch plot (1 - 3)
3 = egg mass number (1 - 20)

Sample trees



Where 19 = cluster no. (1 - 75)
2 = tree no. (1 - 3)

Clusters 61-75 are designated as check numbers.

App. No. 16

DOUGLAS-FIR TUSSOCK MOTH EGG HATCH DEVELOPMENT RECORD

							Date			Egg hatch development							
	Egg hatch plot no.	T.	R.	Sec	Elevation	Aspect	First hatch	Bud burst	Bud flush	Date	: Per-cent	Date	: Per-cent	Date	: Per-cent	Date	: Per-cent
Spray block No. ___	1																
	2																
	3																
	MEAN																
Spray block No. ___	1																
	2																
	3																
	MEAN																
Spray block No. ___	1																
	2																
	3																
	MEAN																
Spray block No. ___	1																
	2																
	3																
	MEAN																
Spray block No. ___	1																
	2																
	3																
	MEAN																

App. No. 17

DOUGLAS-FIR TUSSOCK MOTH EGG HATCH FIELD FORM	Control unit	Crew
	Spray block	Date

Egg mass no.	T ___ R ___ sec. ___ Plot 1	T ___ R ___ sec. ___ Plot 2	T ___ R ___ sec. ___ Plot 3
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
TOTALS			

Enter 1 if hatched, otherwise 0.

Bud Development Record

Plot 1	Plot 2	Plot 3

Enter bud development code

T = buds tight
F = buds flush

Appendix No. 18
Project Entomologist

IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT 1974

NOTIFICATION OF RELEASE OF SPRAY BLOCKS

Date: _____

To: _____, Contract Applicator

From: _____, Project Entomologist

The following described spray blocks will be released for spraying on

_____ (day), _____ (date), in the priority listed below:

Priority	Block No.	Total Acres	Remarks
1			
2			
3			
4			
5			
6			

Total acerage released by this notice: _____ acres.

Unless otherwise stated, the lower elevations of each block should be sprayed first if the period of spraying each block exceeds one day.

Approved: _____
Project Entomologist

DEVELOPMENT OF THREE-STAGE SURVEY USING THE COMPUTER PROGRAM MUST

Table 1.--Estimated net cost to sample each for each sample period.

Sample Stages	Layout	Sample period: Prespray	4-day Postspray	21-day Postspray	Egg mass
n(Cluster)	$15.00	$6.65	$6.65	$6.65	$6.65
m(Trees)	2.50	.57	.57	.57	.57
k(Branches)	0	.90	.90	.90	.90

The analysis showed that two branches on the prespray and four branches on the postspray samples should be taken per tree and that three trees per cluster was the most economical unit with respect to variance. A total of 60 clusters would be required if a 15 percent sampling error was desired (table 2). The analysis also showed that to achieve a 10 percent sampling error cost would more than double (table 3).

A minimum of fifteen 3-tree clusters will be established throughout the untreated portion in each control unit. These untreated clusters must be in areas that meet control criteria, but were deleted for reasons such as sensitive areas, research plots, etc.

Table 2.--Sampling size for various percent sampling errors

Calculation of n_{opt} when

m_{opt} = 3 trees

k_{opt} = 2 branches (prespray)

k_{opt} = 4 branches (postspray)

Percent sampling error	Prespray	Postspray	Adjusted number of clusters/unit [1/]
% $s(\bar{y})$	n_1	n_2	9
40	8	10	9
30	13	17	15
25	19	24	22
20	29	37	33
19	32	41	37
18	35	45	40
16	45	57	51
15 [2/]	51	65	58 (60) [3/]
14	58	75	67
13	67	87	77
12	79	102	91
10	113	146	130
5	450	581	516

Recommended sample size for each project unit.

1/ $(n_1 = n_2)/2$ = adjusted sample size.

2/ Desired standard error mean = 15 percent.

3/ Based on the above figures the optimum sampling intensity is (51 + 65)/2 = 58, rounded to 60 clusters. Sample size - three trees within each cluster, two branches within each tree on prespray sample, and four branches within each tree on postspray samples including control areas (no spray).

Table 3.--Cost estimates for the establishment for number of clusters for a percent standard error of 5 to 25 percent.

Percent standard error	Spray plots	Control plots 1/	Recommended size (rounded)	Relative net sample cost
25	22	6	30	$ 2,815
20	33	9	40	3,753
15*	58	15	75	7,037
10	130	33	165	15,482
5	516	129	745	69,904

* Recommended sampling intensity.

1/ Ratio of control plots for check plots is .25.

App. No. 20

DFTM Form 6
5/74

DOUGLAS-FIR TUSSOCK MOTH
CLUSTER SCHEDULE

Unit

Spray block No.	Cluster No.	Date 70% egg hatch	Date prespray	Date released	Date sprayed	Date of 4-day postspray	Date of 21-day postspray	Date fall exam.

App. No. 21

DFTM Form 7
5/74

DOUGLAS-FIR TUSSOCK MOTH
POPULATION EVALUATION
1974

Control unit		Subunit	
Spray block		Cluster	
Recorder		Date	
Township	Range	Section	

Sample period: Prespray _____ 21-day postspray _____
4-day postspray _____ Egg mass _____

Tree	Branch	Length	x	Width	=	Square inches	Tussock moth	Miscellaneous larvae
1	1							
	2							
	3							
	4							
2	1							
	2							
	3							
	4							
3	1							
	2							
	3							
	4							
TOTALS		X		X				

CLUSTER SUMMARY

$$\text{Total branch areas} = \frac{\text{Total square inches}}{2} = \frac{\square}{2} = \square$$

$$\text{Tussock moth per 1,000 square inches} = \frac{\text{Total T.M.}}{\text{Total branch area}} = \frac{\square}{\square} \times 1{,}000 = \square$$

App. No. 22

DOUGLAS-FIR TUSSOCK MOTH
TREE CROWN CLASSIFICATION FORM

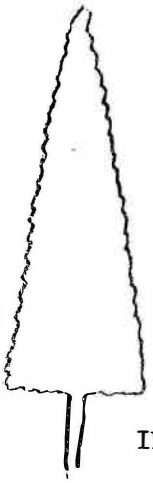
Control unit | Cluster No.

T. R. Sec. | Date

Prefeeding | Postfeeding

Observer

Crown Level	Tree 1		Tree 2		Tree 3	
	Species _____		Species _____		Species _____	
	Foliage		Foliage		Foliage	
	New	Old	New	Old	New	Old
1.						
2.						
3.						
4.						
5.						
6.						
INDEX						



Defoliation intensity code

0 = no visible defoliation

1 = less than 50 percent

2 = 50 to 90 percent

3 = more than 90 percent

App. No. 23

DFTM Form 9
5/74

DOUGLAS-FIR TUSSOCK MOTH FOLIAGE ASSESSMENT LABORATORY FORM (CURRENT YEAR'S GROWTH)	Control unit	Spray block		
	Cluster No.	Date collected		
	Lab examiner	T.	R.	Sec.
	Sample Pre____ 1st post____ 2nd post____			

Branch tip sample	Tree number and species		
	No. 1 Species _____ Damaged/Undamaged	No. 2 Species _____ Damaged/Undamaged	No. 3 Species _____ Damaged/Undamaged
1	/	/	/
2	/	/	/
3	/	/	/
4	/	/	/
5	/	/	/
6	/	/	/
7	/	/	/
8	/	/	/
9	/	/	/
10	/	/	/
TOTALS	/	/	/

Cluster Summary

	Douglas-fir	True fir
Damaged	_____	_____
Total examined	_____	_____
Ratio	_____	_____ 1/

1/ Ratio for each species = $\frac{\text{Total damaged needles}}{\text{Total needles examined}}$

Appendix No. 24

IDAHO

DEPARTMENT OF PUBLIC LANDS

ADDRESS REPLY TO:

DEPARTMENT OF PUBLIC LANDS
COEUR D' ALENE OFFICE
P.O. BOX 670, COEUR D' ALENE, IDAHO 83814

GORDON C. TROMBLEY
COMMISSIONER

May 1, 1974

TO: Forest Land Owners

FROM: Idaho Department of Public Lands - Tussock Moth Control Project

SUBJECT: Community Information Meetings

A tussock moth infestation is building up in North Idaho. It now covers 257,000 forest acres. Medium to heavy damage on fir trees is expected over 104,000 of these acres. Extensive surveys were conducted and a detailed Environmental Impact Statement prepared by the U.S. Forest Service and cooperating agencies. This provided a basis for the decision by the U.S. Environmental Protection Agency to permit contingency use of DDT to protect our forests. A control project is now under way with spraying to begin in early June. Approximately 58,000 acres will be sprayed with 3/4 lbs. of DDT per acre. 46,000 acres of infestation on National Forest lands will be used for field testing of promising natural control agents and check plots or excluded as sensitive areas. Actual aerial application of the natural agents is planned for 27,000 acres. Only those areas where serious damage is expected will be sprayed. Extreme care will be exercised to avoid dairies, apiaries, major streams and other sensitive areas. The private landowner share of project costs has been paid by deducting 5% of the money withheld for disposal of logging slash on private land.

In order that landowners can be informed of control plans, a series of public meetings will be held. We are inviting you to attend if you are interested in the program. Please check the enclosed schedule for date, time and place of the meeting in your area.

Project personnel will be present to answer your questions and explain the project. Maps will be available showing the areas to be sprayed. We invite you to inspect them to determine if your land is included in the treatment area. If it is not and you feel that you have tussock moth that should be sprayed, please consult with a representative of the Idaho Department of Public Lands at the meeting. Arrangements will be made to have your forested land inspected for tussock moth. If tussock moth is present and it meets the population level criteria for spraying as set forth in the Environmental Impact Statement, the area may be added to the spray project. Conversely, if your land is included in the spray zone and you feel it is a sensitive area that should not be sprayed, consideration will be given to your desires. However, there may be areas which cannot be excluded without difficult and costly spray block adjustments. Reinfestation of adjacent forest properties can also result from excluded areas. In this situation the declaration of a zone of infestation (Idaho Code, Section 38-602) provides authority for the eradication and destruction of the forest pest in question on all property.

Maps will also be posted and made available for review by the public at the locations listed on the attached sheet.

There may be some pesticide residues developed in livestock which are grazed on forage directly in the DDT sprayed unit. Studies have shown no effects to the animals. The residue counts have generally returned to prespray levels in 4 to 6 months. Precautions to be taken by livestock owners will be discussed at the meetings.

If you have questions, please feel free to phone or come in and discuss your concerns with us. The North Idaho Douglas-fir Tussock Moth Control Project Headquarters will be at the following locations at the designated dates.

Idaho Department of Public Lands Coeur d'Alene Field Headquarters 701 River Avenue, Coeur d'Alene 667-7989	Present to May 19, 1974
Palouse Ranger Station Potlatch, Idaho 875-3291	May 20 to May 31, 1974
Potlatch High School Potlatch, Idaho 875-3291 or 875-3391	June 1 to End of Project

Thank you for your cooperation.

Sincerely yours,

GORDON C. TROMBLEY
State Land Commissioner

By Dewey Almas
Project Director

DA:drj
Enclosure

TENTATIVE PUBLIC MEETING SCHEDULE FOR
1974 DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT

Date	Place	Time
May 31	Coeur d'Alene *	7:30 p.m.
May 3	St. Maries, Washington Water Power	7:30 p.m.
May 6	Potlatch, Odd Fellows Hall	7:30 p.m.
May 10	Orofino *	7:30 p.m.
May 14	Plummer, Plummer Community Center	7:30 p.m.
May 17	Moscow, County Court House	7:30 p.m.
May 21	Grangeville *	7:30 p.m.
May 24	Troy, High School Auditorium	7:30 p.m.
May 28	Lewiston *	7:30 p.m.

* Exact location or time will be advertised in local papers, or contact State, U.S. Forest Service or County Extension Offices.

MAP LOCATIONS FOR 1974 DOUGLAS-FIR
TUSSOCK MOTH CONTROL PROJECT

In Coeur d'Alene

Coeur d'Alene Field Headquarters
Idaho Department of Public Lands
701 River Avenue, Coeur d'Alene

Panhandle National Forest Supervisor's Office
U.S. Forest Service
218 N. 23rd Street, Coeur d'Alene

Kootenai County Agricultural Extension Agent & Extension Forester
Kootenai County Courthouse
501 Government Way, Coeur d'Alene

In St. Maries

St. Joe Area Supervisor's Office
Idaho Department of Public Lands
1806 Main Avenue, St. Maries

St. Maries Supervisor's Office
U.S. Forest Service
Federal Building, St. Maries

Benewah County Agricultural Extension Agent
Federal Building, St. Maries

Clarkia Ranger Station
Clarkia

In Potlatch

Palouse Ranger Station
Potlatch

In Troy

Troy Woodland Forester's Office
Idaho Department of Public Lands

In Moscow

Latah County Agricultural Extension Agent
County Courthouse, Moscow

Vern Burlison, Extension Forester
College of Forestry, University of Idaho

John Galea
Forestry Sciences Laboratory
1221 South Main, Moscow

In Orofino

Clearwater National Forest Supervisor's Office, U.S. Forest Service
Ahsahka Road, Orofino

Clearwater County Agricultural Extension Agent
Federal Building
Orofino

Clearwater Area Supervisor's Office
Idaho Department of Public Lands
Adjacent to National Guard Armory on Highway 12

In Kendrick

Kendrick Forest Protective District Office
Idaho Department of Public Lands
R.R. Avenue at 9th Street, Kendrick

In Craigmont

Craig Mountain Forest Protective District Office
010 East Lorahama
Craigmont

In Lewiston

Nez Perce County Agricultural Extension Agent
1214 Main Street, Lewiston

Potlatch Corporation
East Lewiston

In Nezperce

Lewis County Agricultural Extension Agent
Lewis County Courthouse, Nezperce

Tentative for Worley, Plummer, Tensed

A Public Place

In Grangeville

Nezperce National Forest Supervisor's Office, U.S. Forest Service
319 East Main, Grangeville

Clearwater District Ranger's Office
319 East Main, Grangeville

Idaho County Agricultural Extension Agent
Idaho County Courthouse, Grangeville

May 1, 1974

NORTHERN IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT

THE INSECT: The Douglas-fir tussock moth is a defoliator of true firs and Douglas-fir. Tussock moth outbreaks average about 3 years but may persist as long as 8 years.

The female tussock moth is wingless. After mating in September, she lays her eggs on the cocoon from which she emerged. Her eggs are bound together in a frothy substance, with hairs from her body forming an egg mass of 130 to 200 eggs. After overwintering in the egg stage, the young caterpillars begin hatching in late May. Caterpillars start feeding immediately and continue until August. They are light and hairy and may be spread long distances by the wind.

CURRENT OUTBREAK: Defoliation by the tussock moth not only retards tree growth but kills trees. Complete tree defoliation may occur in a single season. Weakened trees often succumb to attacks by bark beetles.

EXTENT OF OUTBREAK: 104,000 acres of northern Idaho forests are anticipated to be damaged during June and July of 1974. A critical 58,000 acres will be sprayed with DDT. The criteria necessary to qualify the area as needing control is a concentration of approximately 20 tussock moth caterpillars per 1,000 square inches of tree foliage. If other areas meet control criteria, they may be included in the spray project.

DAMAGE APPRAISAL: Approximately 85 million board feet of timber could be lost and an additional 13 million board feet of potential growth will never be realized without DDT treatment. A net loss of $3,109,000 in forest values will occur in 1974 if the tussock moth is not controlled. The tussock moth defoliation will also create fire hazards, make trees vulnerable to bark beetles, result in loss of young growth, and create poor appearance.

CONTROL OF SPRAY: A 200-foot unsprayed buffer strip will be left around sensitive areas. Landowners' wishes about spraying will be considered. Only helicopters will be used to spray the DDT because of their maneuverability and spraying accuracy. Observation helicopters will monitor spraying helicopters.

BIOLOGICAL EVALUATION: Spraying will start after 70 percent of the tussock moth egg masses begin to hatch and have 3 days to develop. Biological evaluation data, collected during the project, should explain how many tussock moths were killed, how much foliage was saved, and how much growth loss prevented in the northern Idaho control project.

ALTERNATIVE CONTROL METHODS: Two microbial control agents for tussock moths will be tested on 27,000 acres in 1974 in the hope that they will prove effective in the control of the insect. As of now, however, DDT is the only effective means of control.

Prepared and published by the Idaho Department of Public Lands.
For additional information, write or telephone:
Idaho Department of Public Lands, P.O. Box 670, Coeur d'Alene, Idaho 83814
Telephone 667-7989

1974 North Idaho Cooperative Douglas-fir Tussock Moth Control Project

Community Meeting Outline

I. Welcome and Introductions (WF)

- A. U. S. Forest Service personnel
- B. State of Idaho personnel
- C. Others

II. Circulate Attendance Listing

III. Introduction of Subject (I & E Officer)

IV. Tussock Moth Biology (Project Entomologist)

- A. Slides and/or movie
- B. Life cycle
- C. Hosts and feeding pattern
- D. Duration of epidemics
- E. Natural control factors
  1. Starvation
  2. Virus and Bacillus thuringiensis
  3. Microbial tests
- F. Area infested
- G. Fall egg mass survey
- H. Acres affected
  1. 104,000 meet spray criteria
  2. 58,000 is net spray block
  3. 154,000 are light or DFTM present

V. Project Plan (Project Director)

A. Expected impact

1. 85 million board feet - mortality of 1974

2. 13 million board feet - growth loss of 1974

3. $3,109,000 net loss

B. Organization - cooperative nature

1. Spray date

2. Aircraft

C. Control of spray

1. Aerial photos carried by helicopter pilots

2. Sensitive areas marked

3. Observation aircraft

D. Sensitive areas

1. Beehives, pastures, crops, streams, etc.

2. Livestock - considerations in marketing for slaughter

E. Landowner interests

1. Financing - cost to landowners

a. State Pest Control Fund

b. U. S. Forest Service share

2. Minimum size of spray unit

3. Spray criteria

F. Monitoring of pesticide residues

1. Woody Benson - Idaho Dept. of Environmental & Community Services; and Al Espinosa - Project Liaison

2. Forage, litter, shrubs, water

VI. Meeting Recap (I & E Officer)

A. Summary of main points

B. Get names and comments, locations of sensitive areas, etc.

1974 North Idaho Cooperative Douglas-fir Tussock Moth Control Project

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I. Welcome and Introductions (WF)

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USDA FOREST SERVICE

PROJECT PROPOSAL

Forest Insect & Disease Control

1. REG. OF AREA	1
4. STATE	Idaho
2. CAUSAL AGENT	Douglas-fir tussock moth
3. GROUP	DEF
5. CALENDAR YR.	1974

6. TYPE OF PROJECT (Mark one)
- [ ] NATIONAL FOREST
- [X] S & P COOPERATIVE
- [ ] OTHER FEDERAL

7. PROJECT NAME & LOCATION: Coop DFTM - Northern Idaho

8. UNIT: S&PF Lands

9. TREE SPECIES: Douglas-fir, Grand Fir

10. PREVENTION OR SUPRESSION METHOD: Aerial spray

11. PESTICIDE: DDT

12. DOSAGE RATE: 3/4 lb./acre

13. EST. DUR. OF WORK: June-July 1974

14. TYPE OF WORK	15. UNITS OF WORK	16. UNIT COST	17. TOTAL PLANNED COST	18. FUNDS NEEDED BY PERIODS FY 19 74-75 JAN 1 – JUNE 30 A. I&DC.	B. NonFed.	FY 19 ____ JUL 1 – DEC. 31 C. I&DC.	D. NonFed.
(a) Presuppression Survey Acres							
(b) Acres to be treated	50,033	4.83	241,659.42	120,829.71	120,829.71		
(c) Trees to be treated							
(d) Stumps to be treated							
(e) MBM of infested trees to be logged							
(f) Other Monitoring	50,033	1.224	61,240.38	30,620.19	30,620.19		
(g) Sub Total →			302,899.80	151,449.90	151,449.90		
(h) Indirect & Service Charges (Field)	% of (i) 4		12,007.92	6,003.96	6,003.96		
(i) Total Field Costs →			314,907.72	157,453.86	157,453.86		

19. Proposed by → SIGNATURE: GORDON C. [illegible] TITLE: Commissioner, Id. Dept. Pub. Lands DATE:

SPACE BELOW FOR REGION & AREA OFFICE USE ONLY

20. Region or Area Indirect and Service Charges →	% of (21)					
21. Total Project Cost Estimate →						

22. Evaluation Reports: will be sent by (date) _____ ATTACHED [X] CONTINUED PROJECT [ ]

23. PRIORITY

24. PROJECT NO.

25. Approved by → SIGNATURE: STEVE YURICH TITLE: Regional Forester DATE:

SPACE BELOW FOR W.O. USE ONLY

Approved by: INITIALS & DATE	Disapproved by: INITIALS & DATE	Deferred by: INITIALS & DATE

Financed from:	1/1 – 6/30	7/1 – 12/31	TOTAL
I & DC. W.O. Reserve			
I & DC. B. of B Cont.			
I & DC. Supplement			
BRC			
P & M			
Total Financed			
Not Financed due to:			
Deferment			
Disapproval			
Totol Unfinanced			
Total Funds Requested			

Reason for deferment or disapproval

(See instructions on reverse)

5200-10 (REV. 7/66)

OMB NO. 80-R0186

U.S. DEPARTMENT OF AGRICULTURE

APPLICATION FOR FEDERAL ASSISTANCE

(Nonconstruction Programs)

PART I

1. State Clearinghouse Identifier: 00831750

2. Applicant's Application No.:

3. Federal Grantor Agency: U.S. Forest Service

Organizational Unit: Region 1

Administrative Office: Federal Office Building

Street Address – P.O. Box:

City: Missoula State: Montana Zip Code: 59801

4. Applicant Name: Idaho Dept. of Public Lands

Department Division: Statehouse

Street Address – P.O. Box:

City: Boise County: Ada

State: Idaho Zip Code: 83720

5. Descriptive Name of the Project: Coop DFTM Control Project – State and private lands – northern Idaho

6. Federal Catalog No.: 10650

7. Federal Funding Requested: $

8. Grantee Type: X State, ____ County, ____ City, ____ Other (Specify)

9. Type of Application or Request: X New Grant, ____ Continuation, ____ Supplement, X Other Changes (Specify)

10. Type of Assistance: ____ Grant, ____ Loan, ____ Other (Specify)

11. Population Directly Benefiting from the Project: 2600

12. Congressional District: a. 1st b. Statewide

13. Length of Project: May, June-July 1974

14. Beginning Date: May 1974

15. Date of Application:

16. The applicant certifies that to the best of his knowledge and belief the data in this application are true and correct, and that he will comply with the attached assurances if he receives the grant.

Typed name: [illegible] PROBERT

Title: Commissioner, Idaho Dept. Pub. Lands

Telephone Number: AREA CODE | NUMBER | EXT

Signature of Authorized Representative

For Federal Use Only

FORM AD 623 (12-72) PAGE 1

OMB NO. 80-R0186

U.S. DEPARTMENT OF AGRICULTURE

APPLICATION FOR FEDERAL ASSISTANCE (Nonconstruction Programs)

SECTION C – NON-FEDERAL RESOURCES

(a) Grant Program	(b) APPLICANT	(c) STATE	(d) OTHER SOURCES	(e) TOTALS
8. State Appropriation	$	$157,453.86	$	$157,453.86
9.				
10.				
11.				
12. TOTALS	$	$	$	$

SECTION D – FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$	$	$	$	$
14. Non-Federal					
15. TOTAL	$	$	$	$	$

SECTION E – BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS)			
	(b) FIRST	(c) SECOND	(d) THIRD	(e) FOURTH
16.	$	$.	$	$
17.				
18.				
19.				
20. TOTALS	$	$	$	$

SECTION F – OTHER BUDGET INFORMATION

(Attach additional Sheets If Necessary)

21. Direct Charges:

22. Indirect Charges:

23. Remarks:

PART IV PROGRAM NARRATIVE (Attach per instruction)

OMB NO. 80-R0186

U.S. DEPARTMENT OF AGRICULTURE

APPLICATION FOR FEDERAL ASSISTANCE (Nonconstruction Programs)

PART III – BUDGET INFORMATION

SECTION A – BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No. (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Douglas-fir tussock moth	10650	$	$	$157,453.86	$ 157,453.86	$314,907.72
2.						
3.						
4.						
5. TOTALS		$	$	$157,453.86	$ 157,453.86	$314,907.72

SECTION B – BUDGET CATEGORIES

6. Object Class Categories	– Grant Program, Function or Activity				Total
	(1)	(2)	(3)	(4)	(5)
a. Personnel (salaries & OT)	$ 51,033.66	$	$	$	$
b. ~~Fringe Benefits~~ DDT, Fuel Oil, Storage, Mixing	46,030.36				
c. Travel	12,508.26				
d. Equipment Rental	11,507.60				
e. Supplies (Misc.)	3,001.96				
f. Contractual (Aircraft)	117,577.56				
g. Construction					
h. Other Monitoring	61,240.38				
i. Total Direct Charges	302,899.80				
j. Indirect Charges	12,007.92				
k. TOTALS	$ 314,907.72	$	$	$	$
7. Program Income	$	$	$	$	$

EMERGENCY TELEPHONE LIST

Moscow Police ---------- (208) 882-5551

Latah County Sheriff--Moscow ---------- (208) 882-2216

Poison Information Center
Deaconess Hospital
West 800 - 5th Avenue
Spokane, Washington ---------- (509) 747-4811

Moscow Ambulance Service ---------- (208) 882-2422

Hospitals

Gritman Memorial Hospital
710 South Main Street
Moscow, Idaho ---------- (208) 882-4511

Memorial Hospital
Washington Avenue
Pullman, Washington ---------- (509) 332-2541

Doctors (General Practitioners)

Potlatch

Norris A. Biggerstaff, M.D.
225 - 6th Street ---------- 875-4451

Moscow

Donald E. Adams, M.D.
213 North Main Street ---------- 882-7565
Residence ---------- 882-4094
If no answer, call ---------- 882-4511

John M. Ayers, M.D.
Professional Building ---------- 882-2933
If no answer, call ---------- 882-4676

J. B. Britzmann, M.D.
213 North Main Street ---------- 882-7565
Residence ---------- 882-4877
If no answer, call ---------- 882-4511

Rodger G. Hawkins
213 North Main Street ---------- 882-7565
Residence ---------- 882-2750
If no answer, call ---------- 882-4511

North Idaho Tussock Moth
Control Project
Project Work Plan, Addendum No. 1
May 1974

Release and Recall Operating Procedures

I. General

In event it may become necessary to delay, postpone or interrupt the aerial spray operation the following procedure will be implemented and adhered to by all personnel.

II. Potential Causes

1. Injunction(s)
2. Weather
3. Operational
   a. Insecticide formulation
   b. aircraft, both spray and observers
   c. spray application
   d. support equipment (tankers, pumps, etc.)
   e. serious accidental spill
   f. injury or fatality
4. Biological
5. Labor - Service and Supplies
   a. strikes
   b. shortages
6. Public Sentiment

III. Action Plan

1. The Project Director will notify in writing, all project staff officers of any action necessitating project interruption exceeding 24 hours.
2. Depending on the seriousness and time frame of the interruption, the Air Operations Chief and the Entomology Chief will be the responsible officers effecting release and recall of all project personnel.
3. Execution
   a. Expected delay, 24-36 hours - no release
   b. Expected delay, 24-72 hours - release all project personnel, in writing, that can return to their home units and work effectively for the balance of the delay. For those unable to comply, they will remain on standby at the project work site.
   c. Expected delay, 72 hours plus. Release all project personnel for return to their home units.
   d. All releases will be conditional to recall. Recall will be effected by a telephone call or written notice at least 8 hours advance notice prior to report time.
   e. Monitoring Personnel - The Project Director will notify the monitoring liason officer of any interruption or resumption in project execution. All monitors will determine their own release and recall actions.

Addendum No. 2

1974 NORTH IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT

EMERGENCY TELEPHONE LIST

(Additions to Original List - Appendix No. 27)

Federal Aviation Agency Spokane, Washington		1-509-456-4683
Civil Air Patrol - Tom McLaughlin Coeur d'Alene Airport	Office - Home -	1-208-772-2531 1-208-687-2021
Idaho Department of Aeronautics Boise		1-208-384-3183
Idaho State Police c/o Latah County Sheriff's Office, Moscow		1-208-882-2216
Medical Investigator Latah County Coroner c/o Latah County Sheriff's Office, Moscow		1-208-882-2216